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Cement and Engineering News

Vol. 32 Chicago, January, 1920 No. 1

Knowing How

By Walt Mason

IN EVERY BUSINESS there are gents who look like twenty-seven cents.

For information they don't yearn, and they're too slovenly to learn the rudiments they ought to know, before collecting coin they go.

Throughout the world they loom up strong—the half-baked men who do things wrong, who never really learned the trade in which they earn their marmalade.

The concrete trade has suffered long from half-baked men who do things wrong, who never study, read or think, whose work is always on the blink. You see their handiwork, alas! whate'er direction you may pass, and every misfit job they leave makes every careful workman grieve.

The half-baked gentleman exclaims, "I've tried a hundred different games to make a living in this town; at all of them I've fallen down. I've failed at everything I tried; I don't know why, doggone my hide! But I can do this concrete work, and make it pay, or I'm a Turk. It is the simplest thing in view; why, all a fellow has to do is mix some gravel and cement, and go ahead with fell intent."

And so he goes ahead, slap-bang, and puts up work not worth a dang, and folks who patronize this gent are prejudiced against cement. They say, "This substance makes us sick; hereafter we'll use stone or brick."

The job is weak that should be strong; the half-baked workman did it wrong.

The first-class man will never spurn a chance to read, a chance to learn. He knows there are a thousand facts which ought to govern all his acts; that he will cause widespread distress if all his work is done by guess. The man of special knowledge wins, where others fall and bark their shins.

Don't to the half-baked crowd belong; do all things right, and nothing wrong.

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ways cannot accommodate. They will bring foodstuffs direct from the producer, coal direct from the mines, and manufactured products direct from the manufacturer,—to the door of the retailer or consumer. The measure of reputation for economy and satisfaction they reach, however, will be directly in proportion to the amount of organization and efficiency of operation that is applied to their use. Unorganized and with each truck operating where it will bring the most profit to its owner at whatever rates the "traffic will bear," they will make the very least of the opportunity that is offered them. Working along definite routes at uniform rates and in cooperation with one another to assure full capacity loads both going and coming, they will establish a record for proficiency and hasten the time when they will replace the railroad in many forms of hauling. This implies the encouragement of motor express routes, organized by public service laws if necessary.

It is very readily conceivable that the effects of the coal shortage will be so far-reaching that the production of high grade motor trucks in sufficient quantities to meet demand, will be impossible. In such an event it behooves the truck owner to obtain the greatest amount of productivity he can from each unit in his service. Maintenance cost records, return load bureaus, selection of drivers, driver cooperation, and time saving loading and unloading methods are some of the things that the operator cannot know too much about. It is the duty of the manufacturer and of the salesman to furnish the owner with educational data and ideas that will be helpful to him, and it is the duty of the owner to apply careful study to the fulfillment of his transportation requirements.

That the compulsory use of trucks by those who have always depended on the railroads will cause a great many to ship their goods by motor vehicles in the future, is a foregone conclusion. While the efficacy of the truck has already been proven, many still have to be educated to its economics, and a situation such as the coal shortage will bring on, provides the best means for that education.

Better Conditions for Cement Companies

Important stockholding interests in the Cuban and International Portland Cement corporations are convinced that the fusion of these two companies with those in Texas and Uruguay, constituting the International Cement Corporation, will produce some real benefits. Administrative economies and scattering of risk are probably two of the most important. All four companies, so widely separated geographically, are not apt to suffer from poor business at the same time. It is understood that conditions have recently taken on a much higher aspect at both the Cuban and Argentine properties. The Cuban Portland Cement is operating full, turning out 1600 barrels a day, with costs well in hand. The Argentine company is selling at the rate of 50,000 barrels a month, which is several times the monthly turnover three or four months ago. Moreove, the price has ben advanced from $5 to $6.50 per barrel.

Electric Arc Welding

The Westinghouse Company has issued an elaborate publication concerning the process of electric arc welding and the necessary apparatus for it. It compares the different welding processes and shows the advantages of electric arc welding. Some of the advantages claimed are economy, ease and convenience of application, speed, reliability of results, reclaiming defective material, safety, conservation of material, less skilled labor, required. The field for electric arc welding is unlimited, and the process has made enormous strides during the last few years, until now it is widely used throughout those branches of the metal industry in which work is done on iron or steel in rolled, cast or fabricated forms. New fields for its successful application are being discovered every day.

Remarkable Record in Cement Plant Engineering

A list of 136 wet-process portland cement plants erected since 1906 has just been issued by the F. L. Smidth & Co., engineers, New York City. Of these 16 are in the United States and Canada—all of these built since 1911. Three were built this year—the Indiana Portland Cement Co. plant near Greencastle, Ind.; the Ash Grove Lime & Portland Cement Co. plant, Chanute, Kan., and the Great Western Portland Cement Co. plant at Mildred, Kan.

The other 120 plants are located in Austria, Belgium, Bohemia, British India, Bulgaria, China, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Norway, South Africa, Poland, Russia, Roumania, Siam, Siberia, Spain, Sumatra, Sweden, Switzerland and Turkey—certainly as world-wide a practice as any engineering firm can boast of.

Increased Use of Pulverized Limestone

Increased use of pulverized limestone during the past year was given credit for larger crops in many states at the annual meeting of the National Agricultural Limestone Association at the Deshler Hotel, Columbus, Ohio, this month. Professor Firman E. Bear of Ohio State University reported that 250,000 tons were used in Ohio last year and that 10 times that much could be used with profit to Ohio farmers. C. R. Wagner, field lecturer of the association, told of the increased interest shown in limestone by farmers and of the co-operation the association is securing in its work from agricultural colleges and the federal department of agriculture. The effects of increased freight rates and problems connected with the handling of agricultural limestone were discussed. Columbus was selected for the next annual meeting, the headquarters of the association being there.

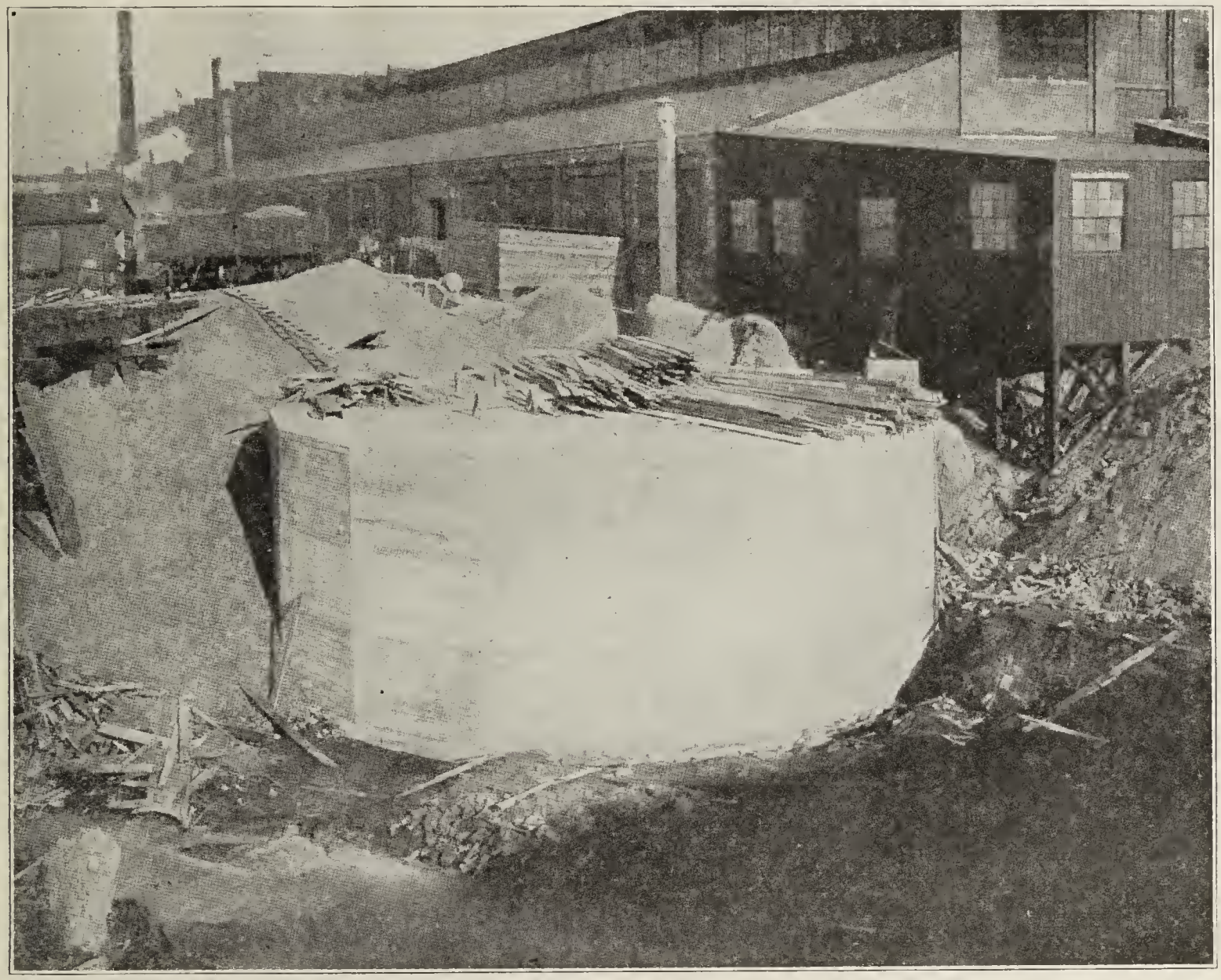
Electric Precipitation Equipment

Westinghouse equipment for electrical precipitation, and which recovers valuable material from smoke and gases, is described and finely illustrated in "Application Circular" 7375 of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It is observed that electrical precipitation processes are now used successfully in lead and copper smelters to reduce metal losses and eliminate smoke nuisances; in cement plants collect potash and cement dust; in acid plants to recover acid from the fumes, and in rock crushers to reduce the dust nuisance. The process is also applied to blast furnaces to elimninate iron-ore dust and to recover potash, as well as to gas plants for removing dust, tar and lampblack from the gases, and to locomotive roundhouses and to power plants in populated districts to remove soot and cinders from smoke. They are similarly applied to industries producing fine powders. It is remarked that although originally designed to surpress a nuisance, electrical precipitation has in practice almost always proved valuable as an investment because of the material it saves.

The Possibilities for Constructing Concrete Oil Storage Tanks Are Almost Unlimited

By C. W. Van Dyke

A truly big business opportunity has presented itself to contractors. What I have reference to is building concrete oil storage tanks or reservoirs. If one will consider the thousands of manufacturing plants throughout our country, the hundreds of oil fields, the immense number of ships, etc., which utilize fuel and other oils, and which require oil storage facilities, then one cannot help but recognize that the possibilities for constructing concrete oil storage tanks are almost unlimited. Without further comment, you can easily conceive the existing opportunities to increase your contracting business.



Oil storage problems solved by using reinforced concrete tanks
View of 182,000 Gallon Tank for Fuel Oil
Owner: American Brakeshoe and Foundry Company, Erie, Pa.
Designer and Builder: Con-Oil Tank Company, 1215 Fulton Building, Pittsburgh, Pa.

....The above picture gives a good idea of the unique design of this tank. The ground plan of a tank is generally in the form of a circle, rectangle or square. It can be seen that this is a polygon. The picture was taken immediately after the removal of forms, and shows the fill started on one side. The tank was finally covered with 3 feet of earth. The manhole is seen at the right side of the top extending 3 feet above the roof to allow for the earth fill.

Promotion Required for New Business

Steel tanks have in the past been used almost entirely to store oil, and consequently a large percentage of plant managers as well as engineers know very little about the decided economical and other many advantages of reinforced concrete oil storage tanks. Therefore, one of the many forceful ways in which you can influence them to have concrete replace steel for oil storage purposes is to hand them a book showing a large number of representative manufacturing firms who have had concrete tanks built during the past. You then can expound upon the advantages of concrete tanks which are: permanency; low first-cost, which is cheaper than steel, except for the tanks of very small capacities; and when built underground, availability of ground area for storage, railroad, roadway or building purposes.

Another means of arousing their interest is to advertise in those papers or publications that are read by individuals of the communities in which you are desirous of building. Promotional letters with a booklet treating on the subject is still another effective means.

The contractor never had a brighter business opportunity presented to him than the construction of concrete tanks. Whether you are successful in securing contracts depends almost entirely upon your own initiative. Without putting forth your best promotional efforts you can not expect new business of this kind.

Construction and Design

The succesful construction of a concrete oil tank is dependent upon: (1) the design, (2) using only good materials, and (3) exercising great care in doing the work.

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1. The design should be made only by a competent concrete designing engineer or architect, or one thoroughly capable for this work. There is a diversity of opinion among designers as to how much stress the reinforcing steel should be computed to withstand. In common practice the range of strength for the reinforcing steel varies from a maximum of 16,000 lbs. per square inch to as low as 6,000 lbs. per square inch. This, of course, is very indefinite. It has been learned by tank building experience that the steel should be figured for a fibre stress of 10,000 lbs. per square inch. It is considered good practice to compute the required amount of temperature reinforcing separately. What is meant by this is that the required temperature steel should be computed and placed, in addition to all other steel. This, of course, is different for each tank according to the location. The temperature range should be ascertained and the greatest variation used in computing the required temperature steel. The designer should visualize the construction as he works and plan to make the placing of concrete as simple as possible. This can often be accomplished by using rods of a larger size which leave a greater space for placing the concrete, and in many other ways the designer can be of material assistance to the constructor.

2. How to Determine Good Sand.—Too much care cannot be exercised in selecting a good grade of clean, well graded sand. A large number of concrete failures can be directly traced to the use of poor sand and not to the design or to the methods of construction. A good sand consists of natural sand or screenings, from hard, durable, tough, crushed rock or gravel, composed of quartz grains or other hard material graded from fine to coarse, with the coarse particles pedominating. Sand, when dry, shall pass a screen having 4 meshes to the linear inch; not more than 25 per cent shall pass a sieve having 50 meshes per linear inch; and not more than 5 per cent shall pass a sieve having 100 meshes per linear inch. Sand containing vegetables or other organic matter should never be used; neither shall one containing more than 3 per cent (by weight) of clay or loam be considered. If the sand of your community meets these requirements, with the exception of the clay or loam content, then you can utilize the same by resorting to washing, for which you can inexpensively construct a good sand washer.

How to Determine Organic Impurities.—Fill a 12-ounce prescription bottle with sand to the 4½-ounce mark. Then add a 3 per cent solution of (NaOH) sodium hydroxide (which you can buy at nearly all drug stores) until the volume of sand and solution, after shaking, amounts to 7 ounces. Shake the contents thoroughly and let stand for 24 hours. If the solution resulting from this treatment is colorless, or has a light, yellowish color, the sand may be considered satisfactory, in so far as the organic impurities are concerned. If you find a dark colored liquid above the sand, wash the sand thoroughly to remove the organic impurities.

Well Graded Crushed Stone or Pebbles Should Be Used.—The crushed stone or pebbles must be clean, hard, tough and graded in size, free from vegetable or other organic matter. The size shall preferably range fom 1 in. down to not more than 5 per cent passing a screen having 4 meshes per linear inch, and no intermediate sizes shall be removed. The objection to crushed stone or pebbles larger than 1 in. is the difficulty of being able to properly work these larger sizes in and around the steel reinforcing rods.

Water.—Undoubtedly much inferior concrete is produced by using too much water. We have not, until quite recently, been able to intelligently appreciate just what it means to use an excessive amount of water. Recent laboratory experiments show that a wide range in compressive strength of concrete at the age of 28 days was obtained by using the same mixture of concrete (concrete mixture 1:4, aggregates graded 0:1¼ in.; mix 1 minute; 1 bag mix), but by varying the amount of mixing water as per the following:

Gallons of Water	28-Day Compressive Strength lbs. per square inch
5.75	2,700
6.0	2,600
6.25	2,400
6.5	2,250
7.0	1,950
7.5	1,670
8.0	1,470
9.0	1,100
10.0	830
12.0	480
15.0	200

The above table shows that the greatest strength concrete is obtained when the least amount of water is used. Using 5¾ gallons of water for a 1-bag mix, a strength of 2,700 lbs. per square inch is obtained; whereas when using 10 gallons of water the strength diminishes to 830 lbs. per square inch, or in other words, only 2/5 of the strength is obtained. It would seem ridiculous to the contractor to have the inspector tell him to leave out 3/5 of the cement as required by the specifications. Any good, reputable contractor would not lower the cement content, even if allowed by the inspector. But remember, that the ultimate strength is reduced by using too much water, just as much as by using too little cement. It has therefore been shown that the water is one of the principal ingredients of concrete and should be measured with the same precision as the other materials. In particular is this true of concrete structures containing liquids. The greatest possible strength should be built into the tank and one of the most important points to watch is the water content of the concrete.

3. Time of Mixing.—The tie required for properly mixing concrete has always been a matter of much argument and discussion. Mixing concrete for one minute after all materials are in the drum of the mixture has always been considered ample time, and it is embodied in most specifications. Although it has been known that a longer period of mixing increases the strength of the concrete, it has always been thought that the progress of the work would be reduced too greatly to warrant the change. This condition does not affect tank construction, as the required amount of concrete is small, and it should therefore be recommended that a 2-minute mix be used. This increases the strength by 10 per cent and also makes a denser concrete, which is one of the most essential requirements of tank construction. Too much emphasis cannot be given the importance of an adequate foundation for the concrete tank. A few tanks have failed, and the cause has been traced directly to foundation deficiencies. The site should be inspected by an experienced engineer both before and after making the excavation.

Monolithic construction is desired and recommended, although placing the concrete continuously is often impossible. The arrangements for placing the concrete should be carefully planned and each operation worked out in detail so that when the placing a concrete is started the work can be carried on continuously, thereby using the smallest number of construction joints.

Curing of Tank

There are two methods successfully used for this purpose.

(1) About 24 hours after all concrete has been placed, fill the tank with clean water for about one month.

(2) Coat the floor, interior walls and interior roof with silicate of soda. For this purpose use three or four coats of a 1 to 4 solution of 40° B. sodium silicate, followed by a finish coat of a 1 to 2 solution. This forms a glazed coat on the concrete, but does not last more than a year, and when its purpose of allowing the concrete to harden has been fulfilled its presence is no longer required. The concrete should be allowed to harden and age for one month before filling the tank with oil, as this increases the oil tightness of the tank.

The second curing process is usually used when water is not available for curing purposes. It is not a process of oilproofing for light oils.

Proper Mixtures

The vital requirements for oil tank concrete are: plasticity (for placing), and density (for oilproofing). Concrete mixed in the proportion of 1:1½:3 has these qualities, if the materials are well graded, the water content is correct, the proper mixing time adhered to, and a standard brand of Portland cement used.

Oilproofing

Concrete oil tanks have been constructed to contain oils of all gravities. It has been found necessary to oilproof the concrete for the lighter oils. There are a great many satisfactory oilproofing materials on the market. The quality of the material is of course important, but the workmanship and the methods used in applying the oilproofing should be emphasized as being also of utmost importance. A great many of the oilproofing materials are applied to the inside surface as a plaster coat. This work should be placed in the hands of the most expert waterproofing or plastering contractors. Many such reliable contractors are willing to guarantee and furnish a bond for their work. It is advisable to secure the services of a reputable firm or individual who is willing to make this guarantee.

Why Concrete Tanks

Concrete tanks can be placed underground, partially or entirely above ground. When conditions are favorable, the underground tank should always be given first choice. The advantages of an underground tank are: that the temperature stresses of the tank are reduced to a minimum, the oil is maintained at a more uniform temperature than that of a tank partially or entirely above ground; the available ground area can be utilized for storage, transportation or building purposes. This condition is not true of steel underground tanks, as a steel tank can only be figured to last from 10 to 12 years, whereas a concrete tank is everlasting. Concrete tanks partially or entirely above ground require extra care on the part of the designer and the builder, but are permanent. A steel tank above ground can be figured to last about 25 or 30 years and during its life it requires several paintings and considerable repairing. This continuous maintenance charge accumulates rapidly, and over a period of years amounts to the original cost of the tank. Therefore, when a steel tank is used, you are in reality paying for two tanks for one purpose. These maintenance charges are eliminated by using concrete; you pay for but one everlasting tank. Therefore, anyone interested, can clearly and convincingly understand the enormous economy of building oil storage tanks of concrete.

Concerning Industrial Problems

L. V. Estes, Incorporated, industrial engineers, 202 S. State St., Chicago, Ill., have issued a very interesting booklet, "Human Relations in Industry," which is described as an attempt to set forth the underlying principles of personal relations and industrial management that are essential to industrial harmony and maximum production. The opinion is also expressed that many of the difficulties in the present industrial situation are due to a lack of understanding of these principles and their place and relation to each other in industry. Everyone interested in our industrial life will find the book instructive and thought-inspiring. A two-page diagram entitled "An analysis of the factors of industry," merits careful study.

Motor Truck is Modern Empire Builder

It is only a short time ago that the automobile was a novelty.

The first American motor truck was made in 1898 in a little shop in Brooklyn. It was a Mack and was used to carry sightseers in Prospect Park, Brooklyn.

By 1914 the motor truck had proved itself a commercial success; but it took a big war to make people realize that it is one of the greatest means of transportation.

From 5,000 motor trucks in use ten years ago, the number has increased to 500,000. It is estimated that this year alone the number of trucks that will be manufactured and sold will amount to 350,000.

It is a matter of special note that the biggest users of motor trucks are farmers.

To the public, motor transportation holds out a promise of lower cost of living. Rural motor express routes bring produce into cities from farms within a large surrounding area and, by eliminating several handlings between producer and consumer, materially reduce prices of foodstuffs.

This is also true with many other products. It means lower prices to consumers and better prices for producers.

The motor truck links together more closely than ever before the farm and the city, and is bringing about an improvement in living conditions in both country and city.

The remarkable progress of motor truck transportation makes it necessary to build roads to carry the loads.

Millions of dollars are being spent for the improvement of our country roads. Instead of a narrow, shortsighted policy that will mean the waste of huge sums of money for roads that will be inadequate a few years hence, common sense and foresight must be used and our roads built with the needs of ten years in the future in mind.

"The motor truck brings the most modern and economical means of transportatilon to the door of practically every farmer," says R. E. Fulton, vice-president of the International Motor Co., manufacturers of Mack trucks, "and as transportation facilities in a community are improved conditions improve. Land values increase because the price of land depends upon what it costs to get products to the market. Communities with good roads are always the most prosperous and up-to-date.

"Great empires that will rival those built by the railroads in the past will grow and improve with the advent of good roads and motor transportation."

Compact Concrete Homes For Industrial Workers

A community consisting partly of a comparatively new type of concrete house was recently established by the Phillipsburg Development Corporation near the big Ingersoll-Rand Works in Phillipsburg, N. J., and it is an enterprise that is well worth the inspection of any manufacturer or municipality interested in housing projects.

The type of house is that shown by the ilustrations accompanying this article. This house is known popularly as the Ingersoll type, because of the fact that Mr. Charles Ingersoll, of Dollar Watch fame, who has been greatly interested in housing projects for a number of years, is largely responsible for the particular type of construction. Certain patents covering the forms used in building the neat little homes are controlled by Mr. Ingersoll and his associates. However, there is nothing secret or mysterious about the method of building, and it is one from which any contractor or property owner may well take lessons. A number of these houses have ben built in different sections of New Jersey. The general opinion is that they are admirably arranged, considering their size and that they represent close to the maximum of value for the cost. Before labor and materials took a big jump, the cost of these houses was figured in the neighborhood of $1,000 each. It is not, of course, expected that they could be built today at such figures, but it is fair to say that in the Phillipsburg work the costs are running well below $2,000 per house, including plumbing, doors, painting, etc., but not the value of the land.

Mr. Ingersoll has furnished a detailed statement of the cost of the erection of these houses, using as his basis twelve houses built at Union, near Elizabeth, N. J., in the summer of 1918. The average material cost was $937.36, while the average labor cost was $965.66, making a total of $1,963.02. But it is explained that building this first group of twelve was largely an experimental job, during which the working crew had to be trained for this particular type of construction. It is planned to erect 40 of these houses at Union.

Twenty-five of these concrete houses was recently erected in the Phillipsburg development enterprise. Fifty more six-room houses of the same general style of construction will be erected, making a community of seventy-five permanent homes of small but attractive type. As will be seen by the floor plans, the details are worked out unusually well. On entering one of the houses one hardly expects to find room for a modern bathroom, but it is there just the same, and a surprisingly good bathroom at that. Each of the bedrooms has a closet, and the kitchen cabinet built in the combination kitchen and dining-room is one that would look all right in a house costing $6,000 or $7,000 or more. Other good features are the laundry tub and kitchen sink placed together in such a way that the top of the tub serves as a drain board for the sink. All of these details have been worked out so as to give the largest amount of conveniences in the room available.

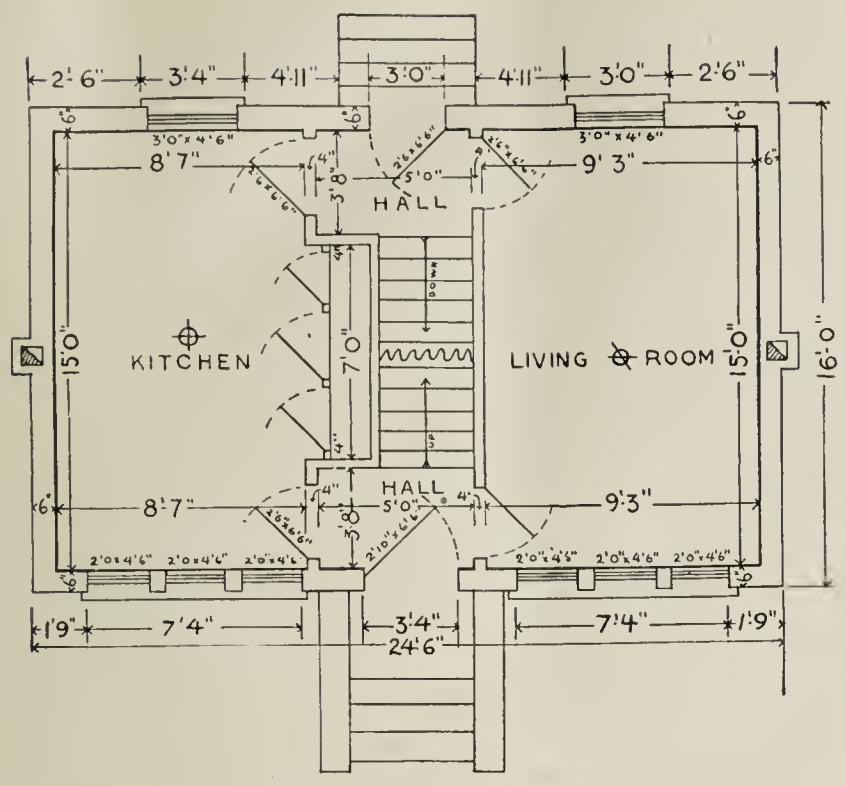
Cinder concrete is used in the Phillipsburg work, and the houses require 80 cubic yards each. The amount of reinforcing is 1,600 pounds per house. The roof, walls, partitions and under floors are poured in one operation. Window frames, door frames, flue linings, electric light conduits and plumbing roughing are all placed before the concrete is poured. It is possible by the same system to pour the front and rear steps and cellar-way while the remainder of the house is being poured.

The cellar walls are eight inches thick and it will be observed that the cellar is well out of ground and is unusually well lighted, thus giving desirable additional space in the basement floor.

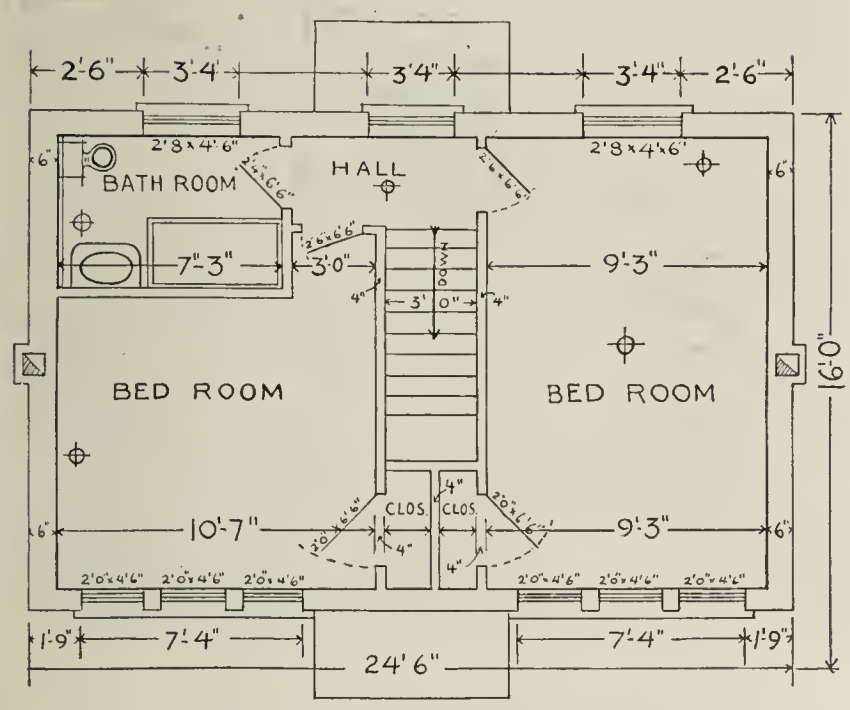
In a number of cases, in these Phillipsburg houses, where the ground slopes back from the house, an artistic back entrance through the basement door will be provided for rather than a flight of steps to the first floor.

Walls above the first floor are 6-inch solid concrete but have grounds on which furring can be nailed. An interior thin wall is then placed, consisting of wall board and plaster, which gives a 1-inch air space between the main wall and the plaster wall. This plaster wall has a sand finish. The beamed ceiling is in white plaster. Green is used for all of the outside wood trim, which gives a cool, inviting appearance along with

Laying a basement floor preparatory to putting forms in place.



FIRST FLOOR



SECOND FLOOR

the light gray tone of the outside walls. The outside of the house is first washed down with a stucco coat in which a proportion of hydrated lime is used so as to fill up pores and provide a white background on which a slap of stucco finish can then be applied. This slap finish is put on with a rough brush.

The pouring operation can be completed in 8 hours. In the Phillipsburg development the forms have been removed from one house beginning Monday at noon, taken across the street to another site, forms completely erected, house poured and concrete work entirely done by Saturday. During December the houses were kept heated for four days as a protection against freezing or a retarded setting of the concrete.

Both the upper and lower floors are concrete with wooden grounds on which a wood floor is nailed. The stairway from the first to the second floor and the porch roofs are also wood. These and the door frames and window frames comprise the wooden construction.

Heating is provided for only the living room and kitchen, as the designers figure that it is unnecessary to heat the two bedrooms in so small a house. The bathroom gets the excess heat from the kitchen stove, and it is figured that the circulation of heat from the kitchen and the bathroom will provide all the heat that may be required for the two small bedrooms.

Concrete window boxes will be made and placed on the concrete brackets under the windows in the front of the house.

By the Ingersoll system no variation is permitted between houses cast in one set of molds. The basic idea with which Mr. Ingersoll started developing his system (whose engineering and building problems were worked out by Harvey Dodge, with many details of the application handled by Fred Fowler) is that of manufacturing houses as distinguished from their construction, producing in a group of houses a continuous repetition of certain sets of operations, permitting the greatest possible economy in erection of the structure in each individual case. In short, the idea is to apply in some measure to houses some of those manufacturing principles which have scored so successfully in making Ingersoll watches.

The Ingersoll system is the nearest approach which has been made to the theory of house construction advanced eight or ten years ago by Thomas A. Edison. The outstanding difference is the fact that in the Ingersoll system no top form is used for the floors. The hydrostatic pressure of the concrete in the walls, the pouring being continuous for the complete structure, is disregarded. Advantage is taken of the fact that concete of a proper consistency, allowed a few minutes in which to congeal, ceases to flow even under con-

Completed except for porch

siderable pressure later applied. Pouring is first done on one side of the house till the concrete flows to proper floor level and then pouring is done on the other side, returning later to the first position.

The wood forms are built out of 2″ stock crossed at right angles with best grade ⅞″ lumber, creosoted to preserve them and thoroughly painted. They are oiled before use and cleaned after use to such an extent as may be necessary and oiled where the surface requires it. The excavation is first made; 2″x4″ side rails are staked down; footings and floor placed in one piece. From this basement floor vertical corner posts, 6″x6″. are first set up on wedged blocks, the posts extending to a story height. These are held plumbed and true by trusses made of 4x4's and ⅞″ bridging. Adjustments to true lines is virtually automatic. All parts are carefully made and permit no variation greater than 1/16″. The trusses are held to posts by iron bands made on each part and driven rigidly home by wedges. The from members proper, inside and outside, are supported by trusses with bolts passing though from outside to inside with wooden washers for spacers, these being covered at each end by round iron washers strung on over the wooden washers to leave the round piece of wood well inside the wall when forms are removed. Outside forms are held further to line by horizontal 4″x4″ strings which may be seen in the illustration. The floor forms inside are also supported by the trusses, as also is the entire weight of the false structure and of the concrete as placed. Trusses carry the load to the 6″x6″ corner posts, 10 of which are used in each story. The outer forms support brackets for staging from which the upper forms are handled in erection and in stripping. The cornice and parapet forms are held by braces to outer forms, each piece having a precise location. In fact, every piece used has its unit number and a definite place in the erection scheme. Even with common labor, after a few operations, it has been possible to take a piece down from one house which has been poured and set it in the proper position on the next house without rehandling. (At Phillips-

A kitchen that pleases housewives

The bathroom is thoroughly modern

burg, a runway between two houses made this shifting very rapid.) When a certain stage of erection is reached the plumber and electrician are sent for and the conduits and pipes which are prefabricated are set in the walls with very few lost motions. Reinforcing rods and metal flue linings are then placed and nailing blocks are set. Blocks are placed ready to hand for embedding in floors when they are screeded. The concrete used is one part cement, two parts sand, and four parts cinders. The steel used is as follows: In each corner of building ½″ rods; a ½″ rod each side of each opening; ⅝″ rod extending entirely around the building at each floor level with extra steel at door and window lintels. All roughing for the plumbing and all conduits are embedded in the concrete.

In the erection of the forms the entire weight of the structure, both forms and concete, is first placed on the corner posts, which in the four-room house are 10 in number. Yet these corner posts are first to come down when the forms are stripped. This is possible in view of the fact that the bolts passing through the walls and trusses, which support the forms, serve as a means of transferring the load to the concrete. As soon as a house is from 24 to 48 hours old under favorable weather conditions, the wedges are driven out, the corner posts are removed and set up for the next house

in the operation. Trusses are then taken down and if the floors require further support temporary shoring of about two 4x4's in each room are put in. The trusses are then removed and set up on the corner posts for the next operation. The form parts then come down in pieces as needed on the next job. The floor forms, which are usually the last to come down, are the last to be required to be set up on the next operation.

Mr. F. M. Coogan, an executive of the Alpha Portland Cement Company, is President of the Phillipsburg Development Corporation, and the construction work is under the direction of Mr. Paul R. Smith, an experienced architect. As will be observed by the illustrations, the houses, instead of being laid out monotonously side by side, are in some cases grouped so as to form a large yard or court.

The Alpha Portland Cement Company, Easton, Pa., has published a sheet of details of this type of concrete house, which they will gladly send a copy of to any of our readers.

Bulletin, Jeffrey Pulverizer

Jeffrey Mfg. Co., 914 North Fourth Street, with branches in all the principal cities of the United States and Canadian office at Montreal, has issued Bulletin No. 142, illustrating and describing Type "A" Jeffrey stone pulverizer. This type is a general purpose machine suitable for reducing dry rock products and many fibrous materials to the moderate degree of fineness required for many purposes. It will reduce limestone to the finest sizes necessary for road building and concrete stone. A table is given of approximate speed capacity and power list. This booklet will be mailed free to those interested and the Jeffrey Mfg. Co. will gladly have its engineers give the benefit of their two-score years' experience along this line.

Educating Cement Plant Employes in Safety

J. C. Jossé, Superintendent, Continental Portland Cement Company, St. Louis, Mo.

The National Safety Council's General Manager, Mr. C. W. Price, tells us that if those who lose their lives in preventable accidents every year in the United States were laid shoulder to shoulder they would make a path 6 feet wide and about 14 miles long and those seriously injured would make a path 6 feet wide and 786 miles long. Think of it, more than a round trip from St. Louis to Cincinnati.

When you think of those paths, my friends, don't you believe it is time that safety work and safe practice education should take its place where it belongs at the very beginning of all our industrial and public work, and should have a prominent part in our plant organization? Nothing pays bigger dividends to our employers, and to ourselves than safety to the employees and their families. The peace of mind, the feeling of contentment you have when you go home from the plant knowing that you have done your duty toward your fellowman in trying to keep him alive and uninjured is certainly worth all the effort you can put forth in that direction.

I have been asked by Mr. Jacobsen to prepare a paper on educating cement plant employees in safety. This subject is extremely important to us all. We should bear in mind that owing to the many different hazards in and around our plants a great deal of time and attention is required to get results, and only by giving the best that is in us and by constantly keeping up the interest in the work can we accomplish anything worth while.

I shall endeavor to explain the method used in our work at the Continental plant.

The first move in our safety work was to join the National Safety Council, and when we began to receive those splendid posters and other valuable information we began to get busy. We put up our bulletin boards in conspicuous places throughout the mill. About this time insurance inspectors recommended various guards. We started putting up guards and other safety devices and our insurance rates kept rising at regular intervals and while the guards did some good the net results were not what we had hoped for. Then we began our campaign of educating the foremen. This you will find is essential. A foreman must be a safety man or his value to the organization decreases materially To sell the foremen the safety idea is the hardest problem of all; but after they are sold, they usually remain good safety boosters.

Our first shop committee consisted of all foremen, and we got some good results, but we found we were not reaching the men, although an opportunity to drive home the safety idea was never allowed to pass. We kept men constantly at work building guards, replacing ladders with stairways made of steel and with steps of steel grating to prevent the settlement of dust, but still our results were not what we thought they should be. It was only when we conceived the idea of taking the rank and file for our shop committees that we got the real results.

This result was attained by giving the men something definite to do in this great work, to make them feel that they were an important factor, and that we had to have their coöperation to be successful. That this work was for the benefit of themselves and families. That they and their families are the real sufferers in case of an accident. That their financial burden in case of injuries is far greater than the employer's, and that in no case does insurance compensate the full income loss, to say nothing of the pain and suffering. When you get the men to see and realize this, then you begin to get the results of your work.

We found the very best way to do this was, after a certain amount of preliminary education, to give the workmen something to do in this movement. So we organized our plant into eight departments, each department has a shop committee of three, appointed for three months, and each member is designated by a big white button with the words "Safety Committee" on it. These shop committees are composed of men taken from the rank and file, and they make their reports to the central committee, which is composed of three men who are graduates of the Safety Supervisors' school, that was conducted in St. Louis by the Mississippi Valley Section of the National Safety Council last winter. The recommendations are acted upon in their turn, and it is astonishing how many practical recommendations are made and how few are impractical.

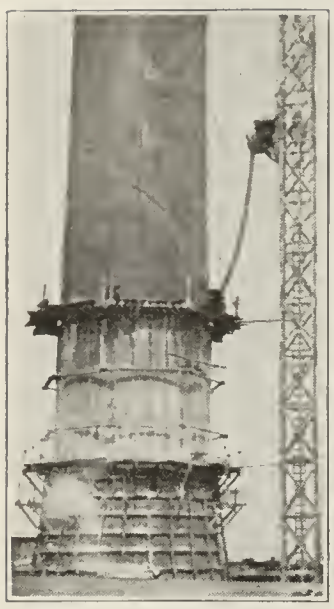
Each plant will have some problem that will not lend itself to any hard and fast rule, and there may be other plans that will work out as well as the one just explained, but all those who tried this method have been well pleased with the results.

The most important thing in my opinion is to get the coöperation of the men themselves, and the matter must be placed before them in the light that safety work is to their benefit and welfare to a far greater extent than to the employer. When you succeed in doing this you will get results.

Steel Stack Gets Concrete Overcoat

Wooden Tower Said To Be Highest in the World Is Erected on Roof of Cleveland Building

By C. W. Garrison



A five-inch ring of reinforced cement was placed around one of the 214-ft. steel stacks on the Cleveland Electric Illuminating Company's power plant by the chute and tower method while the stack was in continuous service, with a resulting saving in time and money. The great steel stacks, 40 ft. in diameter at the base to 19 ft. at the top, were becoming weakened by rust and the chemical action of smoke. A concrete coating was proposed as a remedy, but a difficult problem was how to place the concrete. George Wiltsie, superintendent for the Rust Engineering Company, who were the contractors, supplied the answer.

Concrete was mixed at ground level, hoisted in the small tower shown in the foreground in the photograph, and carried by chutes to a receiving hopper at the foot of the high tower. There it was raised to the desired height and placed in the forms by means of an elephant trunk chute.

When ready to pour concrete the chute was swung half-way around the stack to the point farthest from the concrete tower. As the forms were filled one or two of the 3-ft. chute sections were removed so that the mixture could be placed exactly where it was wanted. After one-half of the concrete ring was poured the same operations were repeated on the other side of the stack.

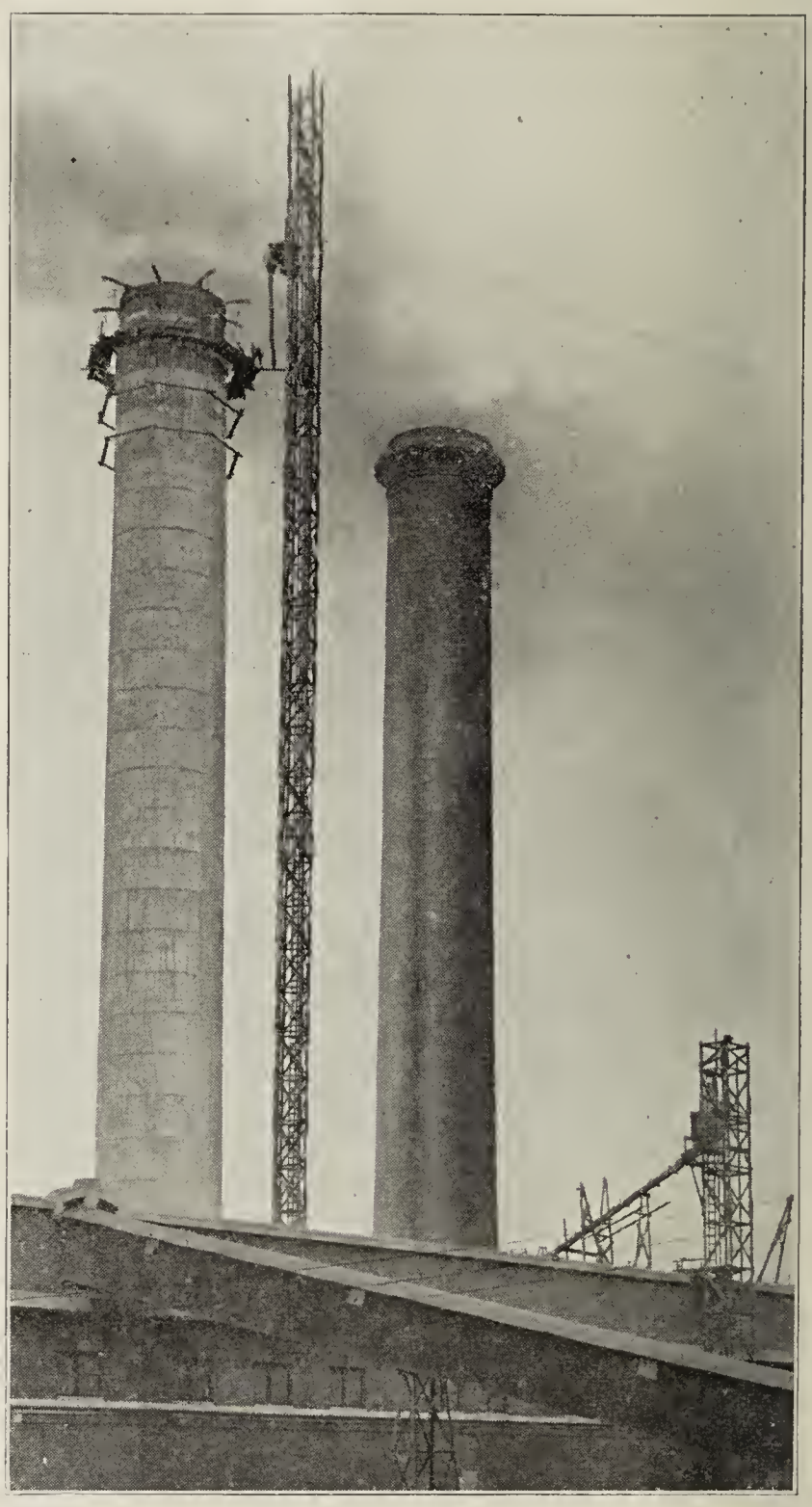
This method necessitated the construction of a tower 256ft. high—thought to be the highest wooden tower ever built. The height of the top of the tower above the level of Lake Erie was 311 ft. As shown in the pictures the working scaffold was hung from a cat head.

The total volume of concrete used was about 140 cu. yds. At the base of the stack the inside diameter of the concrete ring is 40 ft. and the concrete is 9 in. thick. At 16½ ft. from the base the concrete is 7 in. thick. The steel stack tapers to 32-ft. diameter at 34½ ft. from the base. The concrete is 5 in. thick from this point to the top of the stack. At the top the diameter of the steel stack is 19½ ft. The concrete is heavily reinforced with ⅝-in. rods and wire mesh. Wood forms were used on the first 34½ ft. and steel forms for the remainder of the height. The aggregates were heated before mixing by steam pipes extending through the material piles from the power house. The concrete was protected while setting by a heavy tarpaulin wrapped around the stack.

Work was begun late in December, 1918, and the job was completed by May 1, 1919. The rate of progress on the job depended on the speed with which the forms could be moved. The largest week's work was the pouring of six 7½-ft. sections 5 in. thick. From 9 to 12 men were employed, including hoist operators and the mixing crew.

Their work illustrates the flexibility of spouting methods as applied to placing concrete. The rate of speed at which the work progressed through the winter months and the small force required also are interesting.

The application of a concrete overcoat to many decrepit steel stacks scattered throughout the country is one method of meeting the present high cost of steel and improving the efficiency of industrial power plant stacks. When an old stack is overcoated it is unnecessary to provide inside forms and the result attained is



Almost at the top

a durable concrete stack at a comparatively low cost.

The attention of contractors and industrial plant executives is called to this effective method of reconstructing old steel stacks. Their usefulness can be prolonged for many years.

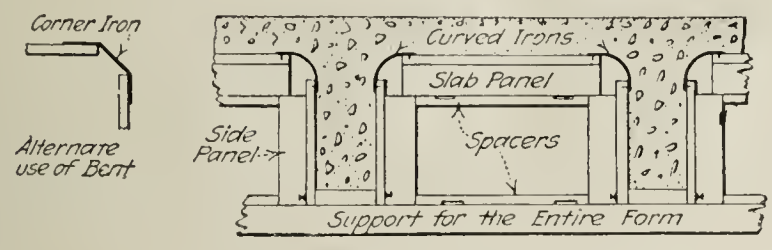
Floor Forms Designed for Easy Stripping

By providing special curved corner strips of tin, Samuel P. Baird, engineer and contractor, of Columbus, Ohio, has greatly facilitated the stripping of concrete floor forms in his work. The design of the typical form is shown on the accompanying drawing.

In erecting the form, the trestle labeled "Support for

the Entire Form" is first put up. Then the beam pieces are placed in exact position and the side panels are nailed, with double-headed nails, to the bottom beam pieces. The lower spacer is then nailed only to the side forms, and the top panel, with the spacer attached, is placed. The curved galvanized-iron pieces are next attached, as shown, by tacks. These pieces are made up in a tin shop and well soldered. They are 16 in. long each way and lapped over the adjoining pieces so that no cutting is required.

When the forms are to be stripped, sufficient additional supports are placed under the beam bottoms, the upper and lower spacers are removed and the trestle support is lowered about 1 ft. by means of four pulley blocks supported by previously placed wire loops in



EASILY DETACHABLE CONCRETE FLOOR FORM

the slab ceiling. These loops come through No. 20-gage circular plates 12 in. in diameter which cover holes in the ceiling panel, permitting the panels to fall when the double-headed nails are drawn. Notches are cut in the spacers so that a bar can be inserted to pry them out.

When the double-headed nails are drawn the entire form is free, except for the adhesion to the concrete. If the forms have been well oiled this will be small, and by shaking the forms they will generally fall the short distance to the support. When all the panels in the bay are down on the support, the entire form is lowered by the pulley blocks.

Instead of curved corner pieces, the angular piece shown in the alternative sketch is sometimes used. This is cheaper but has not as good an appearance as the curved corner. All of the corner pieces may be used many times, the only damage being due to too secure tacking.

Limestone Causes Higher Production

What ground limestone will do in increasing the yields on rundown soils has been clearly shown by H. G. Bollinger of Jasper County, Ind., who co-operated with County Agricultural Agent Stewart Leaming in carrying on a limestone demonstration on his farm near Francesville for two years. A sixty-acre field was used in the demonstration. Twenty acres were limed in 1917 and twenty more in 1918. This year, the plot that was limed in 1917 yielded twenty-three bushels of wheat an acre, the plot limed in 1918 yielded seventeen bushels and the plot which received no lime, produced fifteen bushels.

The soil in this field is characteristic prairie land. It is black, level and well drained and although it is fine looking, lacks potash and lime and it is very disappointing to people just coming into the country. When Mr. Bollinger moved to another farm in Illinois a few years ago, it was badly run down and he started to grow clover in an attempt to build it up. The condition of the soil and the poor seasons of the last two years made it impossible for him to get any kind of a stand.

In the winter of 1917-1918 he began using lime, making an application on twenty acres of it. The entire field was sown in rye and in the spring was seeded to clover. A fairly good stand of clover which was obtained was plowed under. The rye crop produced twenty bushels on the limed portion of the field and fifteen bushels on the unlimed.

In the fall of 1918 twenty more acres of the sixty were treated with lime and the entire field sown to wheat. Sweet clover was sown in the spring and produced a good stand until the dry weather of this summer came.

The respective yields of twenty-three bushels, seventeen bushels and fifteen bushels for the three twenty-acre sections of the field prove what may be accomplished by the application of limestone on our soil.

"Steel Lumber" Handbook

The National Pressed Steel Co., Massillon, Ohio, producers of hot rolled strips and "Steel Lumber" sections in Robal steels, are distributing a reference handbook to engineers and architects for their use in designing various types of building construction. The data and other information it contains will prove useful to all designers of buildings, as it covers a lightweight, economical, fireproof system of construction in steel lumber with structural steel and kindred materials. Complete specifications on steel-lumber construction properties of sections, tables of safe loads, construction details and other designing data are clearly illustrated and described. Steel lumber is supplied in long sections on tonnage basis to steel fabricators, the same as steel shapes are handled, providing prompt shipment.

Book Reviews

Concrete-Steel Construction. Part One—Buildings. By Henry T. Eddy and C. A. P. Turner. Pages, 447, xxv, 6 x 9 in.; numerous illustrations and diagrams. Published by the authors in Minneapolis, Minn., 627 First Avenue, north.

This book is now in its second edition, rewritten to embody advanced theoretical developments. It is a treatise on the elementary principles of design and execution of reinforced concrete work in buildings. The effort of the authors is to elucidate the harmony existing between correct theory and scientific practice and disclose the error of commonly accepted methods of computation of applied bending moments by showing how unwarranted is the assumption that the statical moment about any section in a plate is all pure bending moment, instead of being a combination of applied bending and twisting moments. The authors state that their discussion of the analysis of the column and flat slab problem presented in 1914 by attacking it through analogy to a plate of some kind of homogeneous material, brought to light so many misconceptions of fundamental principles that a thorough treatment of elementary principles has been made in order that the subject matter may be more clearly and generally understood. In presenting a correct analysis of bending and twisting moments, an effort has been made to avoid higher mathematics and to simplify the subject matter so far as possible.

The underlying idea of the treatment throughout the work is that it is necessary for the reader to understand elementary principles before he becomes competent to grasp the more intricate and complex discussion of practical details. The development of these principles has been given close attention as a preliminary study for a more extended discussion of practical work and details later on.

Charted Summary of State Concrete Road Specifications

Information Arranged for Quick Determination of the Main Features—Explanation of and Comments on Chart

By A. N. JOHNSON, Consulting Highway Engineer,
Portland Cement Association, Chicago, Ill.

Accompanying this article is a charted summary of state highway specifications for concrete roads, which shows at a glance the main features of the latest obtainable specifications of the various highway departments. This chart is not complete, as a few state highway departments have prepared no specifications for concrete roads, while a few others have not responded to requests for copies. However, adequate information is given to show the trend in the practice of constructing concrete roads.

will make it clear. The headings of the columns indicate the subjects. Where practice is divided between but two or three variations, the column headings so indicate, and those states specifying a particular method are indicated by a dash in the appropriate column. Thus, the relative number of states following the one or the other practice in a given particular is readily seen. Where the variations are greater in number and such variations could be represented numerically, the different sizes, distances or proportions are inserted under the proper column heading, which also shows the unit of measure represented by the numerals.

In general, where blank spaces occur opposite a state name under all the column captions covering a given subject, it indicates the specifications for such a state are silent upon the subject.

The printed specifications for a number of states refer to the plans for the details and exact manner in which a certain feature is to be executed. Such occurrences have been so indicated upon the chart; but in those instances not so clear or accurate an indication of the actual practice among the various states is gained. This is particularly true in regard to the reinforcement, thickness of slab, superelevation at turns and other features, about which but little information is gained from the text of the specifications.

Attention is directed to the relatively large proportion of specifications which call for a definite grading by sizes, for fine aggregate. The results of very extended investigations made by Prof. D. A. Abrams at Lewis Institute, Chicago, have shown that these arbitrary divisions of fine aggregate by sizes do not necessarily give a grading that will produce the best concrete or, in fact, be a measure to indicate the quality of the aggregate; and that if many of the gradings specified for fine aggregate were strictly followed it would result in the rejection of much material from which as good concrete could be made as with material that would be accepted under a particular specification.

The French coefficient for wear for coarse aggregate is specified in perhaps a third of the specifications. The requirements vary from 12 to 6. The use of the French coefficient for the purpose of determining aggregate for concrete roads is apt to be somewhat misleading and incomplete. The French coefficient of wear was developed to determine to relative value of crushed rocks for macadam-road work, and, due to the fact that the action of traffic upon aggregate in a concrete road is much different from that in a macadam road, this leads to some misinterpretation. Also, as the test cannot be made upon gravels which are used for coarse aggregate in so much concrete work, its application is incomplete. It is probable that investigations now under way will make possible more uniform requirements in this particular; but it may be pointed out that rock which tests not over 6 or 7 is in successful use in many miles of concrete roads.

SUMMARY OF VARIOUS STATE HIGHWAY DEPART

STATE	FINE AGGREGATE.			COARSE AGGREGATE			MIXING						CONSISTENCY		COLD WEATHER		FORMS		
	Grading Specified by Sizes	Grading General Only	All To Pass Inches	French Coeff. Base-Top	Max. Size Inches	Min. Size Inches	Cement Factor Bbls. Per Cu. Yd. Base-Top	Proportions.	Time of Mix. Minutes.	Materials To Be Measured	Water To Be Measured	Mixer Timing Device	Mixer-Water Measuring Device	General Provision Only	Specific Requirements.	Work Prohibited	Work Permitted With Precaution	Wood	Steel	To Be Oiled Or Soaped
ALABAMA	—		1/4	8	2	1/4		1-2-3	1	—	—	—	—	—			—	—	—	
ARIZONA	—		1/4	10	2	1/4		1-2-4	1	—	—	—	—	—		—		—		
ARKANSAS	—		1/4	10	1 3/4	1/4		1-2-3	1	—	—		—	—		—		—	—	—
CALIFORNIA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
COLORADO	—		1/4		2	1/4	1.70	1-2-3	1	GENERAL	GENERAL			—		—		—	—	
CONNECTICUT	—				1 1/4	1/2		1-2-4	1 1/2	—				—		—		—	—	
DELAWARE	—		1/3	12	2	1/4		1-2-4	1 1/2					—		—			—	
FLORIDA	—		1/4	10	2	1/4		1-2-3	1	—	—		—	—			—	—	—	—
GEORGIA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
IDAHO	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
ILLINOIS	—		95%-1/2	6	6-2, 5-2 1/2	1/4	1.61	1-2-3 1/2	1	—	—				—	—		—	—	—
INDIANA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
IOWA	—		1/4		1 1/2	1/4	1.70	1-2-3	1 1/2	—	—			—		—		—	—	
KANSAS	.	—	1/4	6 8	1 1/2	1/4	1.40-1.61	1-2-3 1/2	1	—	—			—		—		—	—	
KENTUCKY	—		1/4	10 . 2		1/4		1-2-3	1 1/2	—	—	—	—	—			—	—	—	—
LOUISIANA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
MAINE	—		1/4		1 1/2	1/8		1-2-4	3/4					—		—		—	—	
MARYLAND	—		1/4		2 1/2	1/8		6-1-1 1/2-3 5-1-2-4	3/4 to 1		—			—				—	—	—
MASSACHUSETTS	—		1/4		1 1/2	1/4		1-2-4						—			—	—		
MICHIGAN	—		1/4		6-2, 5-2 1/2	1/4		6-1-1 1/2-3 5-1-1 1/2-3	1	—				—				—	—	
MINNESOTA	—	.	1/2	8	2	1/4		1-2-3 1/2	1	—	—	—			—	—		—	—	
MISSISSIPPI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
MISSOURI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
MONTANA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
NEBRASKA	—		1/4	8	2	1/4	1.70	1-2-3	1	—	—			—		—		—	—	—
NEVADA	—		1/4	8	2 1/2	1/4		1-2-4	1	—	—		—	—		—		—	—	
NEW HAMPSHIRE	—		1/4		2	1/4		1-2-3	1 1/2	—	—		—	—		—		—	—	—
NEW JERSEY	—		1/3		1 1/2	6-1/4, 5-3/4	1.51-1.91	1-2-3	1 1/2	—	—			—		—		—	—	—
NEW MEXICO	—		3/8	8	2	1/4		1-2-3	1 1/2	—	—		—	—		—		—	—	—
NEW YORK	—		1/4		2 3/4	1/4		1-1 1/2-3	1	GENERAL				—			—	GENERAL	NOT	SPECIFIC
NORTH CAROLINA	—		1/4		2	1/4		1-1 1/2-3	1 1/2			—	—	—		—		—	—	—
NORTH DAKOTA	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
OHIO	—		1/4	8	2 1/2	1/4	1.75-2.0	1-1 1/2-3	1	—	—	—	—	—			—	—	—	—
OKLAHOMA	—	—	1/4	7 1/2	2	1/4		1-2-3	1 1/2			—	—	—		—		—	—	—
OREGON	—		1/4	6-1/4, 5-2/4		1/4		1-1 1/2-3	.1	—				—				GENERAL	NOT	SPECIFIC
PENNSYLVANIA	—		1/4	10	2	1/4		1-2-3	1 1/2	—	—	—	—	—		—		—	—	—
RHODE ISLAND										—				—				—		
SOUTH CAROLINA	—		1/4		1 3/4	1/4		1-2-4	1					—				—	—	—
SOUTH DAKOTA	—		1/4		2	1/8	1.70	1-1 1/2-3	1	—				—						
TENNESSEE	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o	o	o	o
TEXAS	—	.	1/4	8	2	1/4		1-2-3	1 1/2	—	—	—	—	—				—	—	—
UTAH		—	1/4		2	1/4	1.60	1-1 1/4-3 1/2	1	—	—			—				—	—	
VERMONT	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
VIRGINIA	—		1/4		2	3/4	.	1-2-4	1	—	—	—		—				—	—	—
WASHINGTON	—		1/4		3	1/8	1.66	1-2-3	1	—	—			—				—		
WEST VIRGINIA	—		1/4		2 1/2	1/4		1-2-3	1	—	—	—	—	—				—	—	—
WISCONSIN	—		1/4	7	2	1/4	1.68	1-2-3 1/2	1	—	—		—	—			—	—	—	
WYOMING	—		1/4		2	1/4	1.70	1-2-3	1	—				—		—		—	—	

NOTE: States from which specifications were not available shown thus, o o o o
Otherwise, a blank space indicates that the specifications are silent on the particular subject indicated at top of column

In the mixing there is a very general agreement as to the proportions to be used, the majority of specifications calling for a 1:2:3 mixture. Most specifications now indicate the time for mixing, the larger number prescribing 1 min., while 10 states require 1½ min. and but one or two as short a time as ¾ min.

The measuring of materials is generally emphasized, and specific requirements as to how this shall be done are found in many specifications. There is an increasing tendency to require special timing devices and water-measuring devices. Nearly all the state specifications prohibit laying concrete in freezing weather, while a few allow the work to proceed with special precautions.

There is a wide divergence in the provisions for joints. Four states specify no expansion joints at all, the others requiring expansion joints spaced at intervals varying from 25 to 40 ft. The provisions for finishing afford interesting comparisons, the general tendency being to provide those methods which will insure a dense and true surface. Thus, a few states provide for a split templet to be used at the joints, which is an excellent feature. A majority has adopted the roller-and-belt finish, also for a split float to be used at joints. Four states provide for a machine-finished surface.

Provisions regarding the variation from a true surface are lacking in a number of state specifications, while a number make requirements that are so indefinite as to be impracticable. For example, the provision that the surface shall not vary over ¼ in., without stating the length within which such variation may be allowed, is not a workable specification.

The specifications of a few states make more definite the variation to be permitted, from ¼ in. in 3 ft. to ¼ in. in 6 ft., while a number provide for ½ in. in 10 ft. In a few the allowable variation is ½ in. in 10 ft. and not greater than ¼ in. in any 3 ft. This is an important feature of concrete road building and one to which more attention should be given in the specifications.

Requirements that the concrete be covered with wet earth are general. In a few instances ponding is specified. This latter method has a much wider application than the few instances where it is specified would indicate. Most states require that the concrete shall be covered from 10 days to two weeks. In one instance it is as low as eight days. There is more variation as to the time a road is to be kept closed to traffic, the limits prescribed being between eight days, which is much too short a time, and 30 days.

Provisions for Consistency

Because of its importance, comment regarding provisions for consistency has been reserved to the last. While there is some mention made of consistency in practically all specifications, it is at most but general, and gives no adequate means by which to determine what the consistency shall be.

The consistency of concrete depends upon the amount of water used with a given amount of materials. It is also well known that the strength of concrete is directly dependent upon the quantity of water used, which should be as little as will give a concrete practicable to handle. Thus, the strength of the concrete depends upon the consistency.

The Illinois specifications (edition of April, 1919), alone give any definite measure by which to determine the consistency; this section is as follows:

569. The consistency of the concrete shall be determined by the following test: A cylinder 6 in. in diameter and 12 in. in length shall be filled with concrete which shall be tamped until all voids are filled and a slight film of mortar appears on the surface. The cylinder shall then be removed and the vertical settlement or "slump" of the concrete noted. This settlement shall not exceed 2 in. when the mechanical finishing machine is to be used and shall not exceed 4 in. when the finishing is to be done by other methods permitted in the specifications.

MENT SPECIFICATIONS FOR CONCRETE ROADS

EXPANSION JOINTS					NO JOINTS. END OF DAY ONLY.	REINFORCEMENT			FINISHING							TRUENESS OF SURFACE		CURING				
SPECIFIED	SPACING IN FEET	STEEL PROTECTION PLATES	THICKNESS OF MATERIAL INCHES	DETAILS ON PLANS		SPECIFIED	MESH LBS. PER 100 SQ. FT.	CIRCUMFERENCIAL SPECIFIED	STRUCK WITH TEMPLATE	SPLIT TEMPLATE AT JOINTS	WOOD FLOATS	SURFACE BROOMED	ROLLER AND BELT	SPLIT FLOAT AT JOINTS	MACHINE FINISH	GENERAL PROVISION ONLY	ALLOWANCE OF VARIATION INCH TO FEET	CANVAS COVER	WET EARTH	PONDING	KEPT COVERED MIN DAYS	CLOSED TO TRAFFIC MIN DAYS
—			¼ - ½	—					—				—					—	—		18	21
—	30		¼ - ½	—		WHEN USED	25		—				—	—				—	—	—	10 - 18	13 - 21
—	37½		⅓ - ½						—				—	—				—	—		7	14
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	30		¼						—				—	—			¼ —	—	—		10	14
—	25		⅛						—		—	—							—		8	8
					—	SEE PLANS			—				—					—	—		14	30
—			½ — ½	—					—				—	—				—	—		18	21
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
					—				—				—		—		¼ —	—	—	—	12	30
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	36		⅜			OVER 20 IN. DC			—		—				—		¼ — 6	—	—		10	14
—	33⅓		¼ - ⅜			WHEN USED	42		—				—	—			¼ —	—	—	—	14	30
—			⅓ - ½	—		SEE PLANS			—				—	—			½ — 13	—	—		12	17
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	50		½						—		—						¼ —		—			
					—				—	—			BELT					—	—		10	10
—									—		—	—				—		—	—		14	14
—			¼	—					—				—	—			⅛ — 13	—	—		14	14
				—	—	—		—	—				—		—		¼ — 3	—	—	—	14	21
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	35		½										—	—					—		10	14
—	25		¼						—				—							—	12	21
—	40		¼ - ½			WHEN USED	25		—				—	—				—	—		18	21
—	36		⅜ - ⅞			WHEN USED	34		—				—	—					—		10	14
—	30		⅜ - ½			WHEN USED	25		—				—	—				—	—		18	21
—	30		¼ - ⅞						—		—	—		—			½ — 10		—		14	13
—	40		¼ - ½			WHEN USED	25		—				—	—				—	—		16	21
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	40		¼ - ½			WHEN USED	28		—				—	—			½ — 10	—	—		10	21
—	40		¼ - ½			WHEN USED	25		—				—	—				—	—		18	18
—	30			—		SEE PLANS			—		—	—						—	—		10	21
—	200 to 500		½	—		WHEN USED	25		—				—	—	—			—	—		18	21
—	30		⅜ - ½						—		—	—						—	—		14	14
—			¼ - ⅜	—		SEE PLANS			—	—	—						¼ — 3	—	—		10	14
—	36		¼											—			¼ —		—		10	14
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	40		¼ - ½	—		WHEN USED	25		—				—	—				—	—	—	18	21
—	40		¼ - ⅜			—		—	—				—	—			¼ —	—	—	—	14 -	30
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
—	40		¼ - ½						—				—	—				—	—		18	21
—	30		⅜			WHEN USED	28		—				—	—					—		10	30
—	30		¼ - ½				25		—				—	—					—		10	14
—			¼ - ⅜						—	—	—		—	—			¼ —	—	—	—	11	14
—	30		¼						—				—	—			¼ —	—	—		10	14

Safety Factors in the Use of Explosives in Cement Rock Quarrying

By Dr. Walter O. Snelling

(Continued from December issue.)

The characteristics of different types of explosives is really the subject for a paper itself, and I feel that this matter, and a study of the factors on which the selection of explosives for any particular type of blasting depends, would require more time than can be properly given to them in this paper. With proper explosives from 3½ to 4½ tons of rock can usually be obtained per pound of explosive used, but this also is a factor which is dependent upon many conditions in the quarry, so that a direct comparison between blasting in one district and in another district is often impossible, and sometimes leads to conclusions which are unfair to really good practice in a district in which unfavorable conditions such as clay parting seams exist. I have known of districts in which the "lay" of the rock and its toughness have caused 2½ tons per pound of powder to represent really excellent blasting, and I have also seen districts in which 4 tons of rock per pound of powder was being produced by blasting methods which by improvement could easily have been raised to at least 4½ tons per pound of powder and possibly some little higher.

It should be remembered that the cost of the powder in the blast is far from being the sole factor to be considered in blasting costs. Many a quarry superintendent has found to his cost that a primary blast in which too little powder was used lead to an increase in the cost of shovel work and of secondary blasting entirely out of line with the small difference between the cost of the powder originally used, and that which would have been required for a well-balanced shot.

It is the cost of the rock at the crusher which the quarry superintendent should regard as his standard of comparison, rather than the cost per ton of the rock immediately after a shot. Frequently it will be found that adding one or two cents per ton to the cost of the primary blasting will result in a reduction of three or four cents in the cost of secondary blasting and steam shovel operation and the wisest economy is that which looks beyond the first cost, and gives careful consideration to the ultimate cost.

Secondary blasting is at best to be regarded as a necessary evil. Modern practice tends to reduce secondary blasting to a minimum by the following methods:

a. Improvements in primary blasting, for the purpose of reducing to a minimum the amount of rock which must be block-holed or bulldozed.
b. Increase in the size of shovels and cars, and increase in the opening of the crusher to take rock in larger sized pieces.

These two methods of procedure should in fact go hand in hand, and as manufacturers are today building crushing machinery of greater strength and with increased size of inlet, and increased skill on the part of the superintendents and foremen is leading to constant improvements in blasting methods, we can confidently look forward to a steady improvement in regard to secondary blasting operations.

Two methods of simultaneously firing a number of shots in quarrying are available, one method being by the use ofelectric detonators, and the other by the use of detonating fuse or cordeau.

Cordeau, frequently known as "Cordeau detonant, or Cordeau Bickford" is lead tubing filled with T. N. T. Experiments have shown that such cordeau explodes at the rate of approximately 5,300 meters per second, and accordingly where a number of holes are connected together by means of lines of cordeau the holes become in effect one single hole.

Electric detonators are copper capsules which contain a detonating charge of fulminate of mercury or equivalent material, and a small loop or "bridge" of very fine wire, which can be heated red hot by the passage of a very small electric current. As the rate at which an electric current travels is stated to be 300,000 kilometers per second (186,000 miles per second), it is evident that where a number of electric detonators are connected to a single source of electric current, their detonation is absolutely simultaneous for all practical purposes.

Both cordeau and electric detonators have their advantages and disadvantages for the simultaneous firing of large blasts. Where a number of widely separate charges are to be simultaneously fired electric detonators have some advantage over the use of cordeau, while on the other hand cordeau has some advantage in wet holes, and particularly in holes where the explosive charge is interrupted by length of stemming for the purpose of "raising" the average height of the charge.

One of the advantages possessed by cordeau is that as the line of cordeau extends the entire length of each hole, the entire column of explosive is brought into detonation at a speed which is determined by the rate of detonation of the cordeau itself. If, for example, a hole 100 feet deep were to be filled with an explosive having a rate of detonation of 3,000 meters per second, and the explosion of its charge to be brought about by an electric detonator placed in the bottom of the hole, the detonating wave would pass through the column of explosive at this rate of 3,000 meters per second. If instead of this arrangement a line of cordeau extended from the top to the bottom of the hole it is evident that this would communicate detonation to all parts of the explosive in contact with the cordeau at the rate of detonation of the cordeau itself, instead of at the normal rate of detonation of the explosive The explosive would still probably detonate at its normal rate, but the cordeau would increase the rate at which the column of explosive would detonate through its length. Opinions differ as to the advantages which are gained from this simultaneous detonation of the entire length of a column of relatively slow explosive. For certain special purposes there can be little doubt that it helps bring about a desired "timing" of the explosion of several different types of explosive used in a single blast, and possessing different normal rates of detonation. The use of cordeau as a convenient and safe means of simultaneously firing a number of holes is increasing, and many quarries have replaced the use of electric detonators by this method of firing holes.

When electric detonators are used in blasting in well-drill holes, the best practice is thought to be the use of at least two detonators in each hole. The detonators should be so spaced that the uppermost detonator is about equally far from the top of the column of the powder and from the center of the charge, and the lowermost detonator is similarly equally far from the top of the column of the powder and from the center of the charge, and the lower-most detonator is similarly equally far from the bottom of the charge, and from the middle of the charge. By this arrangement the detonator occupies the center of the column of explosive of which it is to bring about the detonation. In a well-drill hole having 60 feet of powder the lower detonator would be 15 feet from the bottom of the hole, and the upper detonator would be 15 feet from the top of the column of explosive, the two detonators being 30 feet apart. Whenever electric detonators are

used, care should be taken that several feet of powder are above the detonator, before tamping the powder, since the fulminate contained in detonating caps is much more sensitive than any high explosive used for blasting purposes, and the striking of a detonator by the tamping bar, and particularly the grinding of a detonator between the tamping bar and the side of a hole, would be practically certain to lead to an accident.

In lowering electric detonators into the hole the best practice is to attach the detonator properly to a cartridge of explosive so that the cartridge will hang perfectly plumb when suspended from the wire. The cartridge is then lowered by means of the wires to its proper position in the hole. If sufficient care is not taken to have the cartridge of explosive hang plumb from the wire it is very apt to strike against the side of the hole while being lowered, and to cause a "jam." On account of the detonator being in the cartridge, a cartridge so caught should of course be dislodged with considerable caution, and it is better to take a little more care in arranging this priming cartridge, so as to avoid the difficulty and danger of attempting to dislodge it when caught.

When cordeau is used in the hole, it is best to use a cartridge as a "weight" to carry the cordeau to the bottom of the hole. The advantage of having a cartridge on the end of the line of cordeau, in addition to keeping the cordeau straight, is that it enables the blasting foreman to tell by the "feel" as soon as the line of cordeau has reached the bottom of the hole.

No advantage is gained by having more than one line of cordeau in a hole, and accordingly this is never done. If there is reason to believe that a line of cordeau has been broken off in the hole it is sometimes good practice to lower another line of cordeau into the hole to the depth at which the break of the first line is known to have occurred.

In using cordeau, it is well to remember that in spite of the remarkable rate at which the explosive wave passes through the material, it does not have the ability to jump a gap. Even so small a space as two or three millimeters (one-eighth of an inch) acts as an efficient barrier against the transmission of the detonating wave, and for successful results it is imperative that there should be no break whatever in the continuity of the line of cordeau.

In primary blasting the use of well-drill holes has now largely supplanted earlier methods of bench work, and although I will discuss safety precautions mainly from the standpoint of well-drill methods, the same principles will generally hold good wherever open cut blasting work is being done.

In the loading of holes particular watchfulness should be given to insure the complete absence of sparks or hot cinders from the steam shovel, from locomotives, or from the steam well-driller. Those who have watched a steam shovel at work at night will probably have a better appreciation of the menace that sparks represent, than those who have only seen the work going on by daylight, and it should be remembered that it is not only those sparks which are visibly red which are capable of igniting explosives, but that hot cinders which appear quite black may be at a sufficiently high temperature to bring about an ignition. I am inclined to believe that rather more accidents during loading are caused by hot cinders than are usually attributed to that cause, and the only safe practice is to keep all sources of sparks away from the vicinity of the holes during the time that loading is going on. Some quarries have small tents which are placed over the holes while they are being loaded, and while this is better than no protection whatever, yet it is not as satisfactory as the complete removal of sources of sparks during the time of loading.

Of course lighted pipes, cigarettes, or cigars should be rigidly excluded from the vicinity of loading operations. It is even best that men engaged in loading should have no matches in their possession, since a hole in a man's pocket or some other accidental condition hard to anticipate may lead to a match dropping down in the hole, or falling on the rock near the hole where it may be stepped on by the men loading the hole. Even gasoline engines are to be considered as a potential source of sparks. It is true that a gasoline engine only occasionally throws out sparks, but the carbon which accumulates on the piston head and at the end of the cylinder is ejected from time to time in glowing condition, and this, together with an occasional backfire makes a gasoline engine a possible source of accident if too near a hole during loading.

In loading the hole with explosive, it has been proposed from time to time to use holders or clamps of various sorts, in order to avoid dropping the explosive to the depth of the hole. These are not commonly used, however, and experience seems to show that the hazard in dropping a cartridge of explosive through a hole 100 or even 150 feet deep, is very small indeed. The first cartridge would naturaly seem to be the one most likely to explode if detonation from the shock of dropping were really a considerable factor, since the later cartridges drop on the cushion formed by the cartridges already in the hole.

The experienced blaster is able to learn a good deal about the condition of the hole from the sound made by the first cartridge as it drops down, and the sound of the cartridge striking the bottom of the hole, or striking the surface of the water if the hole is wet, is used to determine the fact that the cartridge has gone completely to the bottom. It is excellent practice to "follow-up" the hole by measurements after each case of powder has been loaded, a case of powder ordinarily giving a "rise" of about 4 feet. There is always the chance of cartridges "hanging" on the sides of the holes, and thus leaving an air gap between the powder beneath which has been loaded properly and the point at which the first cartridge thus becomes crossed in the hole. If the "rise" in the hole is carefully followed by frequent measurements such a "block" in the hole will be promptly noticed, and the condition can be readily corrected, but if a considerable amount of powder is loaded over the crossed cartridge before it is discovered that a "choke" exists, the matter is naturally more difficult to correct. An experienced loader can usually tell from the sound made by each cartridge as it drops that it has landed properly on the powder already in the hole, but occasionally a cartridge will hang on the sides of the hole even with good loading practice. A single cartridge can be dislodged safely by the careful use of a tamping stick, but if the "hanging" of the cartridge has not been noticed and more powder has been loaded on top of this cartridge, so as to leave a column of two or three feet of powder above the choke, the dislodging of the material becomes more difficult. Efforts to dislodge such a choke by the vigorous use of the tamping bar are decidedly dangerous, and this procedure should never be followed. The best practice is, of course, to prevent any column of powder from building up on a "choke," by using the measuring line sufficiently frequently to keep in close touch with the level of the powder in the hole, and by paying proper attention to the sound made by the dropping cartridges as they land on the powder beneath. If a "choke" should occur, however, and more than a foot or so of powder should be built up over the crossed cartridge, the safest procedure is usually believed to be the cautious driving of a sharpened stick about 2 inches in diameter through the

"choke," followed by the flushing out of the powder above the "choke" by means of water. Unless a quite excessive amount of water is used, this procedure will not cause the loss of the hole, as the powder will detonate in spite of a rather considerable amount of water which may be present after this treatment.

The size of the cartridges used in loading the hole is not a matter of indifference. For the standard 5⅝-inch well-drill hole the 4½-inch by 10-inch cartridges are commonly used, unless the hole is quite rough and ragged, in which case 4-inch by 8-inch or 4-inch by 10-inch cartridges are used. Using cartridges which are too small is a disadvantage, because the proper density in the hole is then more difficult to attain, while using too large cartridges is a disadvantage, because the chance of such cartridges catching on the side of the hole is materially increased. As a matter of fact the chance of a cartridge choking a hole is increased by the use of cartridges which are either too small or too large, and for well-drill holes the cartridge should preferably be one inch smaller than the diameter of the hole.

In measuring the hole a special tape gives the best results, although in many quarries the tamping stick rope is used instead. Whatever may be the method adopted to keep track of the height of the powder in the hole, the point which should be brought out is the desirability of the measurements being made so frequently as to enable the loader always to know the height of the powder in his hole.

The extent to which powder should be tamped during loading really depends upon the type of explosive which is being loaded, and therefore should more properly be considered in connection with a discussion of the selection of powder for various types of blasting. Tamping of the explosive during loading is quite desirable in the case of the more plastic nitroglycerin explosives, but increasing use is being made in cement rock quarrying of explosives which require little tamping, and indeed in many quarries the explosive is not tamped during the loading, the tamping bar being only used at the end of the loading operation in compacting the stemming in the hole.

If explosives are to be tamped, however, it is most important that too much force should not be used. A rather considerable number of accidents have been due to improper use of the tamping bar, and to the use of unsuitable materials as tamping bars. It should be evident from what has already been said that the presence of any iron surfaces on the tamping bar is a potential source of danger, and that the use of too heavy a tamping bar also involves a rather heavy risk. I have sometimes been told that a heavy tamping bar has advantages when it is properly used, and there may be some truth in this, but the fact remains that when improperly used such a bar becomes a source of danger, and the chance of the bar being improperly used is always present. I have been told of one case in which a type of tamping bar which has been used for some years with perfect safety by a powder foreman was used in his absence by a less experienced man, and in the course of the loading operation a choke developed and an effort was made to drive it out with the tamping bar, and an accident resulted. A lighter tamping bar would have been safer in this case, just because of the possibility of the misuse of a heavier bar by an inexperienced or careless man.

I have seen some rather surprising tamping bars at various times, ranging all the way from solid iron bars to iron-tipped wooden rods. Once, in investigating a "mysterious" accident which had occurred on a piece of railroad work on which a nitroglycerin explosive of low nitroglycerin content was being used, I found that although suitable wooden tamping bars were supplied to the powder men by the contractor, a powder foreman had shoes made of lengths of iron pipe fastened to the end of each of the bars, "to keep them from fraying out so quick," and naturally the inevitable happened, and several men lost their lives in the resulting explosion.

Even wooden tamping bars can be unsafe if too heavy or if carelessly handled. It is not infrequent for sharp pieces of rock to become imbedded in the bottom or sides of a wooden tamping bar, and no one needs to be told that such a tamping bar will strike a spark under favorable conditions by rubbing against the side of a rough hole. The tamping bar should not be too large, in order to avoid excessive friction against the side of a hole, this precaution being particularly important in connection with piston drill holes.

A suitable layer of powder should always overlie each priming cartridge containing a detonator Detonators are always to be treated with great respect, and having two or three feet of powder above the detonator before allowing any tamping to be done is an excellent rule.

The energy that might otherwise be spent in tamping the powder can be utilized to advantage at the top of the hole in thoroughly tamping down the stemming which is applied over the powder. The first two or three feet of stemming should not be tamped, but after this the stemming can be tamped down quite hard, and indeed, if care is taken not to damage the line of cordeau or the electric feed wires, it may almost be said that the harder the tamping of the stemming material, the more efficient the shot will be. Experiments have demonstrated this point rather thoroughly, and a shot which is well confined does perceptibly more work per pound of powder used than can be obtained from a shot in which poorer confinement has been provided.

It is usually unnecessary for workmen to stand on the rock lying in front of the line of holes after the loading begins, and this is a safety precaution which may accordingly be given consideration. Should a premature explosion occur from any cause during the loading operation, the chance of men being injured is naturally less if the workmen are on the far side of the line of holes, instead of between them and the quarry face.

It is of course evident that the final connecting up of the electric detonator wires, or the cordeau connections, should not be made until shortly before the blast is ready to be fired. When electric detonators are used, the method of wiring or connecting up a shot is a matter to which thought should be given. Where only a few shots are to be fired the detonators are often arranged in series, and fired by a blasting machine of the usual type, but in quarries where a good deal of blasting is being done, and where quite a number of holes are to be fired at one time, the parallel method of wiring is often preferred, the electric current being furnished from the power circuit. The connections should always be in parallel when current from a live wire is used in firing the blast.

As electric detonators are sensitive to relatively small circuits, and may be fired by "stray" currents, the existence of which may not have previously been known, the wiring should always be in the hands of competent and trustworthy men, and the holes should not be connected up until the shot is practically ready to be fired. Several cases are known where electric detonators have exploded apparently without cause, and investigation has shown that the wires were abraded at certain points, so that direct contact was established with moist earth or with some conducing metal. In coal mining several accidents have occurred

through stray currents from a passing electric locomotive finding passage through an abraded wire to a charge which was not yet ready to be fired, and at least one accident in a cement quarry has been found to be due to a quite similar cause. These accidents only emphasize the point already brought out, that the lead wires connecting up the separate holes should only be attached when the tamping of the holes has been completed, and when the blast is ready to be fired. In addition, the lead wires should always be kept in good condition, and should be taped if any abraded spots are found.

One of the points which is to be avoided in the connecting up of a blast is too great haste in making the electrical connections. Wires loosely twisted together do not form a good electrical connection, and more than one quarry superintendent has no doubt criticized his powder foreman and his blasting men for a poor blast that has in fact been due to the failure of some of the holes to be fired by the electric current, the detonation of these holes coming through the shock from adjacent holes, and too late to enable the explosive to do its proper share of work in the blast.

The lead wires should not be brought near the exploder wires while loading is going on, and all the connections of the blast should be completed before connecting to the local wires. The custom of having shots connected up to the lead wires and firing battery before work around the holes has been completed is strongly to be condemned, and there is always the possibility that some one will unintentionally fire the blast under these conditions, in the effort to "test out" the battery or the connections without realizing that electric detonators are in the circuit. Probably the safest method that I have seen for preventing accidents from the unintentional applying of current before the blast is ready is the placing in the circuit of a special block, which leaves the circuit open unless a special form of key is placed in it. The key is retained by the man responsible for the blast until the time that the current is to be applied, and is then inserted. Where firing is done from a power circuit a modification of the same principle may be applied, or the switch connecting the lead wires may be locked in position in some suitable way. The one point which I consider quite important is that one man should be responsible for the circuit, and that this man alone should have the key controlling the switch or the safety block.

In firing with cordeau the electrical circuit should be made before the exploder is placed in the special union which connects the detonator with the main strand of cordeau. The manufacturers of cordeau provide special attachments which may be used either with electrical detonators or with detonating caps, and in addition special tools are provided for slitting cordeau in the making of connections and joints.

The rules for safety and efficiency in the handling of explosives in connection with secondary blasting operations are of course not dissimilar from those rules which should be followed in primary blasting operations. In block-holing one pound of explosive will do fully the execution that ten pounds of the same explosive will even in a well placed "dobie." or mud cap shot, while a poorly placed mud cap shot is notoriously wasteful of explosive. It is frequently economical to use the larger quantity of explosive required by the mud cap shot, because of the cost of the drilling of the holes in the block-holing method. A few years ago the situation was much more difficult than it is at present, but recent improvements in light air hammers have materially cut down the cost of secondary drilling, so that the alert quarry superintendent will bear constantly in mind the advantages for and against the block-holing method. Where mud capping is done, it is well to remember that earth and clay are much cheaper than explosive, and that a somewhat larger pile of dirt will be equivalent to a noticeable amount of explosive in the charge that is necessary to break the rock.

Proper protection for workmen in the quarry from fragments thrown by the blast should of course be provided. The usual cylindrical safety shanties of boiler plate provide rather satisfactory protection if located at a suitable distance, and if the doors or openings are turned away from the direction of the blast. In firing a large blast no one should be permitted to remain on the quarry in front of the blast even though the distance may seem safe, for small pieces of stone are frequently projected with exceptionally high velocity and are capable of causing serious or even fatal injuries at a distance considerably in excess of what would appear normally to be a safe distance.

I do not believe it is best to end this discussion of safety factors in connection with the handling of explosives, without calling to your attention the rather small percentage which accidents due directly or indirectly to explosives bear to all accidents which occur in connection with cement rock quarrying. Some years ago I had occasion to investigate and classify the accidents which occurred in coal mining over a period of years. I had read, as all of you have, of those terrible accidents due to the explosion of coal dust which at times sweep through the entire extent of the mine. One such accident, at the Couriere mines in France, led to the loss of more than a thousand lives, while in our own country two such accidents led to the loss of 350 and of 250 lives respectively. On taking up the matter of tabulating all accidents which had occurred in coal mines however, and of classifying them according to their cause, I was rather surprised to find that accidents due to explosives and explosions together were really rather a small fraction of the total number of accidents which occurred. The Bureau of Mines has recently reported there was a total of 2,579 fatalities in connection with coal mining in this country, and of this total 135 deaths were due to explosives, and 129 deaths were due to gas of coal-dust explosions. Accordingly only about one-tenth of all fatalities were due to either explosives or explosions, and only about one-twentieth of all the fatalities which occurred were directly due to accidents from explosives.

Government statistics in connection with quarry accidents show rather similar results. In Tech. Paper 165 of the U. S. Bureau of Mines accidents classified by cause are shown for the year 1915, and of 149 fatalities in quarries or at rock dressing plants and mills the number killed by explosives was but 28, this figure including not only all fatalities due directly to explosives, but also all fatalities due to flying pieces from blasts and other indirect causes.

Mr. Jacobsen has very kindly given me figures in regard to accidents from explosives reported to him during the year 1918 by members of your association, and from these figures I note that all fatal accidents of which he has record which occurred during the year 1918 somewhat less than 8 per cent were due to explosives, and somewhat more than 92 per cent were due to other causes, than explosives. Of all accidents, including fatal and non-fatal accidents, those due to explosives constituted somewhat less than 2 per cent of the total and those due to other causes than explosives constituted more than 98 per cent of the total.

This is a rather satisfactory record, and shows quite clearly that explosives, far from being one of the most

dangerous factors that you have to contend with, are really less dangerous than many other factors to which much less attention is usually given. Falls and slides of rock cause many more fatalities than do explosives, both in coal mining and in rock quarrying.

The ratio which the number of fatalities due to explosives bears to the number of fatalities from all causes is considerably higher in quarrying operations than in either coal mining or in metal mining. It is interesting to note however, that the number of accidents due to explosives in the quarries of the members of your association, compared to the number of accidents from all causes, represents a materially lower ratio than that which exists in the quarry industry as a whole. The last available figures from the Bureau of Mines show that 19 per cent of all fatalities in and around quarries and including crushers, rock dressing plants and mills were due to explosives, while the figures which Mr. Jacobsen has collected covering the operations of the members of your association show that the percentage of fatal accidents due to explosives was only 7.9 per cent of all fatalities, or less than half of the ratio which exists when all quarrying operations of the U. S. are considered.

It should be our aim to improve still further the good record from a safety standpoint which explosives now have in quarrying operations, and I feel sure that this result will be obtained by that spirit of coöperation and mutual helpfulness for which your association so truly stands.

Strength of Concrete Can Be Increased Fully 100 Per Cent by Rodding

Recent experiments conducted by the engineering division of the Bureau of Economic Geology and Technology of the University of Texas have resulted in the discovery that by the simple process of "rodding" the strength of concrete may be increased more than one hundred per cent.

Concerning the experiment F. E. Giesecke, head of the engineering division, says:

"This investigation was begun a little over a year ago at the suggestion of G. A. Parkinson, assistant testing engineer, and the results so far obtained are very gratifying. It has been shown that in the case of concrete containing about six sacks of cement per cubic yard and mixed with about ten per cent of water, the strength of the concrete can be increased fully 100 per cent by rodding, that is, by working an iron rod up and in the concrete so as to allow the excess water and entrapped air to escape upward.

"Some specimens were treated in this manner in the laboratory for seven hours and developed the average strength of 4,644 pounds per square inch in twenty-eight days, as compared with 1,962 pounds developed by specimens of exactly the same composition and age but which had not been rodded.

"The concrete is rodded in the manner described at intervals of about thirty minutes until the material is too firm to permit further rodding.

"The engineering division is conducting additional tests to determine how the effect of rodding varies with the percentage of excess water and with the percentage of cement, and also how rodding can best be applied to concrete slabs, such as are used in bridges, floors of buildings, and the roadbeds of concrete highways.

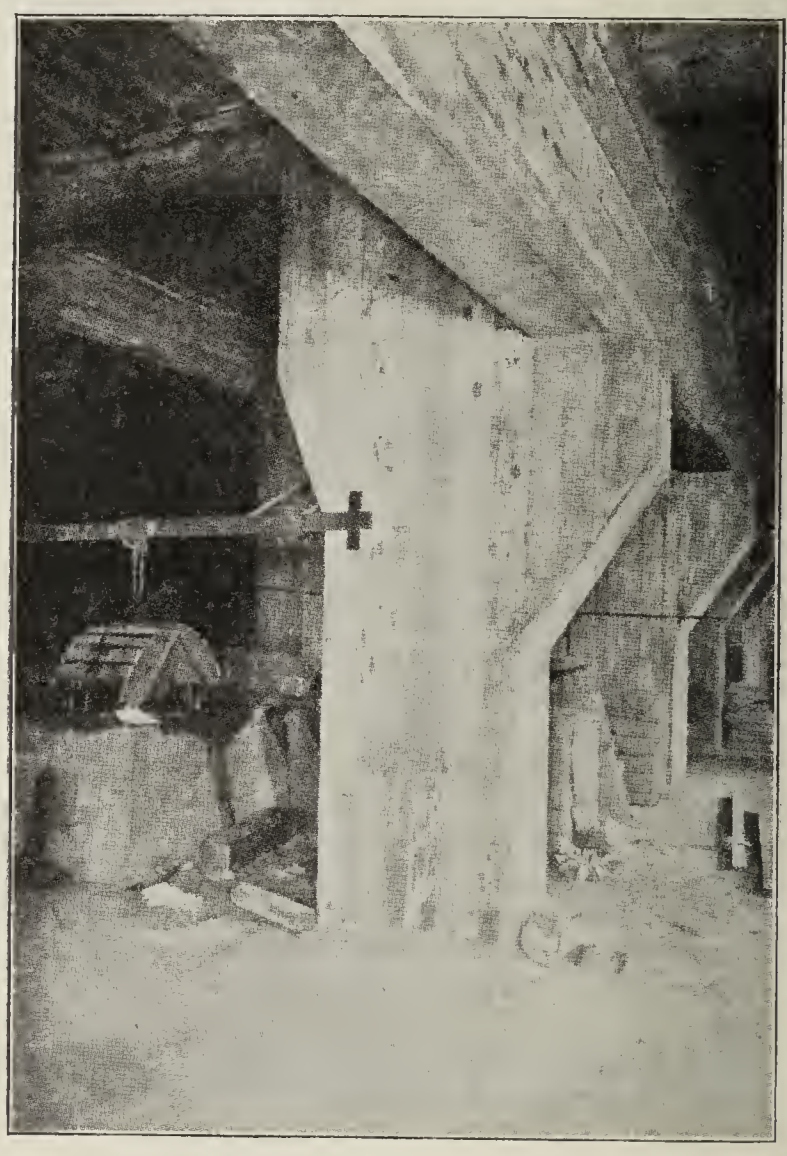
"Those interested in the work and desiring detailed information may obtain such by writing the Division of Engineering, University of Texas, Austin, Tex."

Concrete Solves Long Span and Floor Load Problems

Designed and Superintended by I. G. Engstrom, Minneapolis.

The problem of long spans and heavy floor loads are satisfactorily solved by the use of concrete. The new additions to the B. F. Nelson Manufacturing Company's paper mill at Minneapolis are interesting examples of this form of construction. Here there are several features not met with in ordinary industrial building work.

In the beater room the paper stock is torn to shreds by steel cylinders revolving in water in a sheet iron tank, the resulting pulp discharging into concrete tanks in the basement. Concrete manholes reaching



View showing columns with wide brackets

to within 6 inches of the top of the beater tanks serve to show the depth of the pulp in the tank below. When the concrete tank is full, the pulp will overflow the manhole so that the beater can be shut off before the floor is flooded. As these beaters require frequent repairs and as some of the parts weigh as much as 8 tons each, a traveling crane is provided, the craneway being carried on concrete brackets on the columns.

The machine room addition is approximately 48 feet by 318 feet. This contains the paper-making machine which runs almost the entire length as one complete machine. The pulp from the tanks is introduced at one end of this machine and comes out at the other end as the finished paper product. The extreme size of this machine compelled the designer to use a clear span of 34 feet combined with a short span of about 11 feet for his transverse beams. In carrying his interior columns down to foundation the designer had a peculiar problem to contend with. The paper machine is carried on a pair of long, deep concrete beams for

its entire length and as the distance between the nearest beam and the interior column was 6 or 7 feet, it meant that two columns were necessary to carry the loads to foundation or one unusually large column. However, the designer solved this difficulty by using a single column and building out wide brackets which were proportioned so that the bending due to eccentric loads was balanced. The machine room is 24 feet high and at both ends has a concrete stairway—one straight flight from floor to floor—a span length of 43 feet.

The floors are of beam and girder construction with the panels so arranged as to require the minimum amount of reinforcing which is of the two-way type throughout. 1,400 cubic yards of floor were poured at the rate of 200 yards a day. This result was obtained by proper organization of the concreting crew.

The various forms in which concrete was used—in footings, columns, floors, tanks, retaining walls and flumes—prove the adaptability of this material to any kind of construction. No other building material lends itself to such a variety of uses, as does concrete.

Quality Is Remembered When Price Is Forgotten

By E. G. HOEPPNER, Pres.
Hoeppner-Bartlett Co., Eau Claire, Wis.

Quality work is the best advertising medium for the contractor.

With the possible exception of their family there is nothing in which men and women take so much pride as their home—especially a new one. When you build it for them with quality material and workmanship they are well pleased and happy. They invite their friends to inspect it and incidentally tell them of you and your work. All of which is good advertising because later when these friends are contemplating building they will think of you.

Good Work Procured New Contracts from Competitor's Customer

A short time ago we started building a house next to one that was being erected by another contractor. As both jobs progressed it was evident that our competitor was not using the best of materials and workmanship. The result was that it made the high quality of the materials and workmanship in the building we were erecting stand out in comparison with the house of poorer construction. This was an object lesson to the owner of the dwelling erected by our competitor and later resulted in our securing his future business. He learned that it does not always pay to select a contractor because his bid is lower.

It Only Pays to Do Good Work

It is possible for a contractor to slight work in many ways; some of which will show when the job is finished and others sometime later on. For instance, a good many concrete basement walls are built by using forms on only one side—the inner wall—using earth for the outer wall. Under certain conditions good walls can be built in this way, but as a general rule the walls are not satisfactory because of dirt washing in, and the inner forms being placed so close to the earth that the proper thickness throughout does not result. This is one of the ways which proves that it does not pay to slight a job.

Results of Good Work—New Clients Repeat Orders

The fact that we have adhered to a policy of this kind for twenty years has been responsible for a steady growth of our business—by getting new clients and repeat orders from old ones. We have proven to our own satisfaction that quality work is the contractor's best medium of advertising.

A Silo of Unusual Merit

The silo shown in the accompanying illustration was built with "Polk" steel forms by William DeLhorbe, contractor of Oregon, Ill., for Mr. David Beard, who has an up-to-date farm near Oregon.

Three hundred and fifty sacks of cement were used for the concrete which was re-inforced with twisted steel bars.

The Beard silo is fifty-one feet high and has an inside measurement of fourteen feet. Its capacity is two hundred tons. Even the roof is made of concrete.

Inside the silo has a cement chute with a steel ladder and a continuous doorway.

Mr. Beard has filled the silo many times and always has found the silage to be of excellent quality. Indeed, he is so enthusiastic about this silo that he insists he would not sell it for twice its cost if it were not possible for him to get another.

Mr. DeLhorbe, the contractor, makes a specialty of

Monolithic Concrete Silo near Oregon, Ill.

silo construction and has succeeded in convincing a great majority of the farmers in the vicinity of Oregon—that concrete silos meet all of the requirements of a good silo. He has shown them that concrete silos are air-tight, water-tight, rat-proof, smooth on the inside and—in the long run—the most inexpensive type of silo which the farmer could build for the reason that they are permanent and do not require frequent repairs and alterations. He has convinced a great many farmers that concrete silos are not only wise investments but most profitable ones as well.

The Portland Cement Association, through farm journal advertising and helpful booklets, is also educating the farmer on the silo question. This work has succeeded to such an extent that many small-town contractors—like Mr. DeLhorbe—are specializing in silo construction, and they are all expecting big business from now on, since the farmer has been getting more for his crops during the past year than at any other time in history.

Speed of Construction of Concrete Buildings

The great speed with which reinforced concrete buildings can be erected was splendidly illustrated in the construction of one of the large buildings of the Colt's Patent Fire Arms Manufacturing Co., at Hartford, Conn., by the Aberthaw Construction Co., of Boston. This work is described in an interesting way in a booklet published by the Aberthaw Construction Co., entitled "40 Days at Colt's Arms," from which the following paragraphs are taken:

"It was Friday afternoon, late in August, when the Colt's Arms of Hartford, called us on the phone and said they must have immediately a new building to take care of their orders from the U. S. Government.

"On Monday morning our engineers were on the ground in company with the architects, Monks & Johnson. Arrangements were made to begin work at once; the size of the building was determined—490 ft. by 60 ft., 4 stories with a wing at each end 60 feet square. Like the building we had finished for them a few months before, it was to be of concrete, and built under a cost-plus-profit agreement. It was not necessary to wait for complete plans and estimates. We could begin the moment locations and dimensions were determined. In effect we became their building department, furnished all labor and materials, made all sub-contracts and charged everything up at cost. For our executive services and profit we received our usual commission."

While general plans were being worked out as to the principal features of the plant layout and the handling of the job, tests of the soil were being made to determine the type of foundation necessary. In a very short time a contract was let to the Raymond Concrete Pile Co., 111 West Monroe Street, Chicago, for the construction of the concrete pile foundation. Tools and equipment were shipped, the ground was scraped, advance deliveries of cement made, and work started with only the first rough working drawings as a guide. But by the time the piles were driven and capped and the superstructure ready to start, the architects had the first floor plans detailed so that the contracts might proceed. And so it went, story by story, with the architects always a lap ahead.

For the superstructure a full set of forms for one story were built and this set used successively for the stories above. As a matter of fact, the estimate for the form lumber was made before the completion of the drawings of the first floor by the architects. The contractor and architects were in close co-operation at all times and the plans were made always with a view to utilizing such material as was quickly available. Thus a supply of reinforcing rods which the contractor had on hand were utilized.

Colt's Patent Fire Arms Mfg. Co's new building at beginning of construction, showing arrangement of material yard

Colt's Patent Fire Arms building during construction. Protective measures shown permitted contiuous construction during cold weather without cutting down speed

View of completed Colt's Fire Arms building which was erected in schedule time

The building, exclusive of the concrete piles, required 17,000 barrels of portland cement. Other items were: 4,250 cubic yards of sand, 7,500 tons of crushed stone and 500 tons of corrugated steel bars, varying in size from ⅜ to 1⅛ inch. Columns are of the mushroom type, forms for which were manufactured by the Hydraulic Pressed Steel Co., Cleveland, Ohio. Floors are of monolithic flat slab construction, 9 inches thick, designed for a live floor load of 200 pounds per square foot. The piping, inserts for shafting hangers and other similar fittings were provided for at the time the floors were cast. Conduits for the electrical wiring were embedded in the concrete.

The roof is of solid concrete covered with a 5-ply tar and slag roofing.

Accompanying photographs show some of the work,

which was begun almost immediately on receipt of notice of award of contract. The first work to be done was the test pits, which were started September 1, and the last the carborundum rubbing of the exterior surface, which was completed December 5.

The date for finishing each story was set in advance. This schedule was rigidly maintained, demonstrating that concrete building construction can be carried on in strict accordance with predetermined schedule.

The unusual rapidity with which this large building was completed by the Aberthaw Construction Co. illustrates several fundamental factors affecting the speed of construction of concrete buildings as follows:

First: Actual construction can start almost immediately on signing the contract.

Second: The work can proceed without complete plans, the designers merely keeping ahead of the progress of construction.

Third: There is no framework to be detailed, fabricated in distant shops and shipped. The materials—cement, sand, stone and reinforcing bars—arrive on the job "unassembled," in "bulk" and in any quantity, and delivery can start at once.

Fourth: Available material may be used. Sand and stone are usually near at hand and a supply of cement can be had in nearly all parts of the country on short notice, often requiring only a short truck haul. Available reinforcing bars of various sizes can be used to meet requirements. Bars can be bent with facility to required shapes on the job. Form lumber need not be of special size but lumber of various sizes and kinds may be utilized.

Fifth: All the work can be positively under the direction of one general contractor, who can organize his forces to produce the desired end. He can supply deficiencies in transportation by means of motor truck or team since the materials can be carried in almost any sort of conveyance and are usually close at hand. In the construction of concrete buildings the contractor has the advantage of greatest possible flexibility in the use of his labor, equipment and materials.

New Line of Direct-Current Motors

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., is distributing Bulletin No. 1106 introducing the new Type "E" motors and generators. In developing this new line it has been the aim of the company to produce not only a rugged, serviceable motor, with superior operating characteristics, but also to incorporate the many details which contribute to reliability and safety. These machines are designed for belted as well as direct connected applications and particularly suited to the exacting requirements of machine tool service. Among the important features claimed for the Type "E" motors are: Ratings and speeds corresponding to standard 60-cycle induction motors; complete line of constant and adjustable speed ratings; rugged cast steel yokes; commutating poles, insuring sparkless commutation; dust-proof bearings; windings treated to resist oil and moisture; thorough ventilation; conduit terminal boxes on all motors; improved box type brush holders; standard enclosing covers; interchangeable parts, and accessibility of all parts, all of which are illustrated and described in detail in the bulletin.

New Appointment

The Traylor Engineering & Manufacturing Company, Allentown, Pa., announce that Mr. G. B. Livingood, who for the past two years has been one of their sales engineers, was appointed assistant sales manager of the mining and crushing department on December 1st.

The New Petoskey Cement Mill

An announcement received with a great deal of enthusiasm among the stockholders was made today by Secretary Galster of the Petoskey Portland Cement Company, Petoskey, Mich., who states that J. B. John of Newaygo, Mich., has taken the management of the Petoskey Portland Cement Company, beginning work immediately.

A. B. Klise, president; J. C. Buckbee, vice-president, and John L. A. Galster, secretary and treasurer, were at the conference in Grand Rapids recently, at which time and place the deal was closed. Mr. John has purchased 2,000 shares of stock in the company and will be on the board of directors.

President Klise, Mr. John and Mr. Buckbee are in Milwaukee, where they are purchasing machinery from the Allis-Chalmers Company for the new cement plant, work on which is to start immediately.

Mr. John and Mr. Buckbee predict that the Petoskey Portland Cement Company will be making cement by next September. Mr. John also states that the proposed plant will be the acme of perfection, as it will have all of the latest improved machinery that, in actual use, has proven its worth. The waste heat system will be used whereby the coal that burns the cement will also produce all necessary power so that all expense for power fuel will be saved. The new company will start under most favorable conditions in very way.

Construction of the machine shop will be started the first week in January, and also construction of foundations for the new power house. It is the company's intention to do whatever is possible within the next three months in order to save time and get the plant in operation by the first of September.

Over Coating Saves Coal

In these days when every one is looking for means of fighting old man H. C. L. anything which will help to reduce the size of household expense is of tremendous importance.

Metal lath manufacturers have claimed that the use of stucco and metal lath for overcoating old frame houses would very materially reduce the amount of coal required to heat the house during the severe winter months.

Tests have been recently conducted at the Armour Institute, Chicago, Illinois, by the Associated Metal Lath Manufacturers which prove conclusively that overcoating is an added heat insulation to frame structures.

These tests show that the thermal conductivity of the ordinary frame wall is reduced 15.7% when overcoated with Portland cement, stucco and metal lath. This means that this construction is an added insulation so that 15.7% less heat passes out of the building through the walls. Considering that the windows occupy 15% of the total wall space, the net saving in the coal bill for the owner of a frame house which has been overcoated is 13.3%.

At the present price of coal it is cheaper to overcoat a house than to leave it with an exterior surface through which more than 15% of the heat is lost and which must be frequently painted in order to keep it attractive and in good repair.

Overcoating not only insures a saving in fuel and the cost of upkeep of the building but an old house can by this method be easily modernized and very materially increased in sales value.

American Trade Commissioner for Poland

The first American trade commissioner to Poland will be Louis E. Van Norman, whose assignment to Warsaw is announced today by the Bureau of Foreign and Domestic Commerce, Department of Commerce. Mr. Van Norman, who has just completed a survey of the situation in Roumania, is the author of "Poland, the Knight Among Nations," and members among his personal friends some of the best-known Polish leaders. During the war he was identified with the War Trade Board at Washington.

"Just at this time," says the new trade commissioner, "Poland is of particular interest and concern to the American people. First, there is the peculiar historic appeal of its splendid struggle to regain its sovereign place among the nations of the world, always fascinating to Americans. But we now perceive clearly that Poland stands once more as one of the outposts of western civilization. The Polish people, who have always been a sentinel folk, are today not only the geographical but the spiritual frontier of Bolshevism. Whatever happens to Russia from Germany must proceed over Poland. Whatever new political and social philosophy comes out of Russia can reach the western nations only over Polish soil.

"Here is a vital people, alive today, because it has refused to die. There are thirty millions or over of them, and they live in a country as large as France. With a population nearly equal to that of Italy, a soil rich in crops and mineral wealth, and a considerable industrial development, Poland, situated as she is at the crossroads of trade connecting Central and Eastern Europe, at the gateway of Russia, has the opportunity to become one of the most important factors in the economic life of Eastern Europe.

"It is therefore of the first importance for the American business world to get exact information concerning this Polish country, which may become an important buyer of American goods, and which, on the other hand, will soon be able to export large amounts of raw products to this country.

"The Poles have natural resources in which we are interested. They have coal, sugar, leather, grain, salt. They need a multitude of things that we have to offer. They must have our manufactured goods, our fabrics our tools and machinery, our shoes. More than this, they need our help in credit, in banking, and in many other ways to regain their feet as an independent nation."

Brazil United States' Best Cement Customer

Brazil was the leading purchaser of American cement during the first nine months of the current year, taking 488,000 barrels valued at $1,503,000, according to a department of commerce report. Other South American countries also imported lage quantities of cement fom the United States.

A Handy Souvenir

The Standard Rail & Steel Co., Boatmen's Bank Bldg., St. Louis, Mo., dealers in rails, steel. etc., has issued a very convenient desk or pocket rule giving on the reverse side the weights of different sizes of rails, also their width and height according to the standard of the American Society of Civil Engineers.

How Drivers Can Help Maintain Good Roads

"Drivers can do as much, almost, for the maintenance of good roads as highway engineers," declares Alfred F. Masury, Chief Engineer of the International Motor Company, manufacturer of Mack trucks.

"Did you ever notice," asked Mr. Masury, "in going up a hill, particularly one paved with asphaltic concrete, that the surface on the right hand side of the road is wavy and rough, while that on the left hand side is smooth?

"Well, the reason is this: The extra traction required to climb the hill wears and tears the surface, while there is little or no traction down hill.

"Another thing, the right hand track of the road in either direction is the one which is worn most. This is because of the arched surface of the road which throws the greater weight and strain on the right hand side of the vehicle and consequently the right hand side of the roadway. Truck builders and wagon makers have even adjusted their axels and springs so as to withstand the greater strain on the right hand side of the vehicle.

"The custom of arching the roadways was formed in the early days of road making when dirt and porous-surfaced roads were the ones mostly in use, and it was necessary to give sufficient pitch to the surface of the roadway to drain off the water and prevent it from penetrating the surface of the road to soften and weaken the roadbed. With modern watertight surfaces, the necessity for arched roads does not exist and engineers are designing roads with very slight pitch.

"Drivers can prevent wear to the surfaces of the roads and even improve their conditions, if instead of driving in one track or on the edge of the road, they will drive over the middle and other less used parts of the road when traffic permits. The one thing that is fatal above all things to road surfaces, whether dirt or paved, is driving in tracks, which subjects one small part of the road surface to all the traffic and damage that the whole road accommodates. Traffic should be evenly distributed over the entire surface of the road, and a little thoughtfulness and care in this respect on the part of drivers will do much to add to the permanence and excellence of our roadways."

Concrete Products

It is announced that the San Joaquin Valley Cement Pipe Company, Chowchilla, Calif., has bought an acre lot fronting the railroad reservation in Livingston, Calif., and will begin at once the erection of a 40x60 building to house machinery for a branch plant to be established there. S. Y. Mays, head of the company, was in Livingston recently arranging for the erection of the building.

Mr. J. Webb and Mr. W. Clayburn, representing the Playford Manufacturing Company, Elgin, Ill., who make the Rib Stave Silos, were looking over the ground in Pekin, Ill., recently in the hope that they might find suitable location for the erection of their silo factories there.

The secretary of the Association of Commerce, of Pekin, Ill., together with Mr. McGrath, of the Mc Grath Sand & Gravel Co., Lincoln, showed them over the city and they are very anxious to locate there, on account of the good shipping facilities and the excellent gravel and sand to be had; also the possibility of water transportation.

They were very favorably impressed with the city and no doubt will start a plant there in the near future.

A New Detachable Anchor Bolt

It is often necessary when planning concrete work to provide some means of fastening timbers to the concrete. It has always been a problem for both the contractor and the engineer to devise the best method of accomplishing this work. The engineer realizes that the timbers will eventually rot and must be replaced. Therefore, it is necessary to use a method which will allow the replacement of the timbers. Henry Steers, Inc., 17 Battery Place, New York, are at present building a pier for Wm. R. Grace & Company in Brooklyn and have solved this problem in a very satisfactory way.

They are using a detachable anchor bolt. Figs. No. 3, 4, 5, 6 and 7 show the details of the tin tube, detachable anchor bolt and the washer for the detachable anchor bolt. Fig. No. 1 shows the method of assembling and fastening to the wooden form. After the form is completed a hole one inch in diameter is cut through the form. The tin tube (No. 29 gauge) is then tacked to the form as indicated. The anchor bolt is placed into the washer casting in the locked position, and the washer casting and bolt are lifted into place, passing the threaded end of the bolt through the tin tube, the wooden form and the timber block. The 3½-inch washer and nut is then placed and the nut drawn up tight. The small timber block acts as a washer only and should have a thickness equal to the thickness of the timber to be fastened minus the thickness of the wooden form. In this case a timber 10 inches thick is to be fastened to the finished wall; therefore, as the form is 2 inches thick an 8-inch block is used.

It is well to calk the joint between the tin tube and the wooden form with cotton or oakum to exclude the concrete from the tube. This method holds the bolt and washer casting very rigidly and the placing of concrete can be carried on as usual.

Figure No. 2 shows a section of a completed concrete wall with a 10x12 timber fastened in place. In replacing the timber it is only necessary to give the bolt one quarter turn. This unlocks the bolt from the embedded washer casting and the old timber can readily be lifted off. This method leaves an embedded washer casting in the wall, and a permanent hole in the concrete from the surface to the casting.

This same general idea can be used for fastening smaller timbers to concrete.

Large Production of Phosphate Rock

The three minerals most needed to make our agricultural industry more productive and more prosperous are potash, nitrate, and phosphate. Most of the potash and nitrate we use is imported, but our domestic supplies of phosphate are abundantly ample to meet all our requirements, and for years we have been heavy exporters to Europe. The total quantity of phosphate rock sold in the United States in 1918 was nearly 2,500,000 long tons, having a value of more than $8,000,000, over twice as much as was produced in that year in all the rest of the world. Florida alone produced more than 2,000,000 tons, having a value of about $6,000,000.

A report on the phosphate-rock industry by R. W. Stone, which has just been published by the United States Geological Survey, Department of the Interior, gives the details of production in 1918 by states and by kinds of rocks, shows the world's production by countries and by years from 1910 to 1918, and includes tables showing exports by countries. The report also describes briefly the distribution, character, and methods of mining the phosphate-rock deposits in Florida, South Carolina, and the Western states, gives a resume of the foreign phosphate deposits, and a bibliography. A copy of the report can be obtained on application to the Director, United States Geological Survey, Washington, D. C.

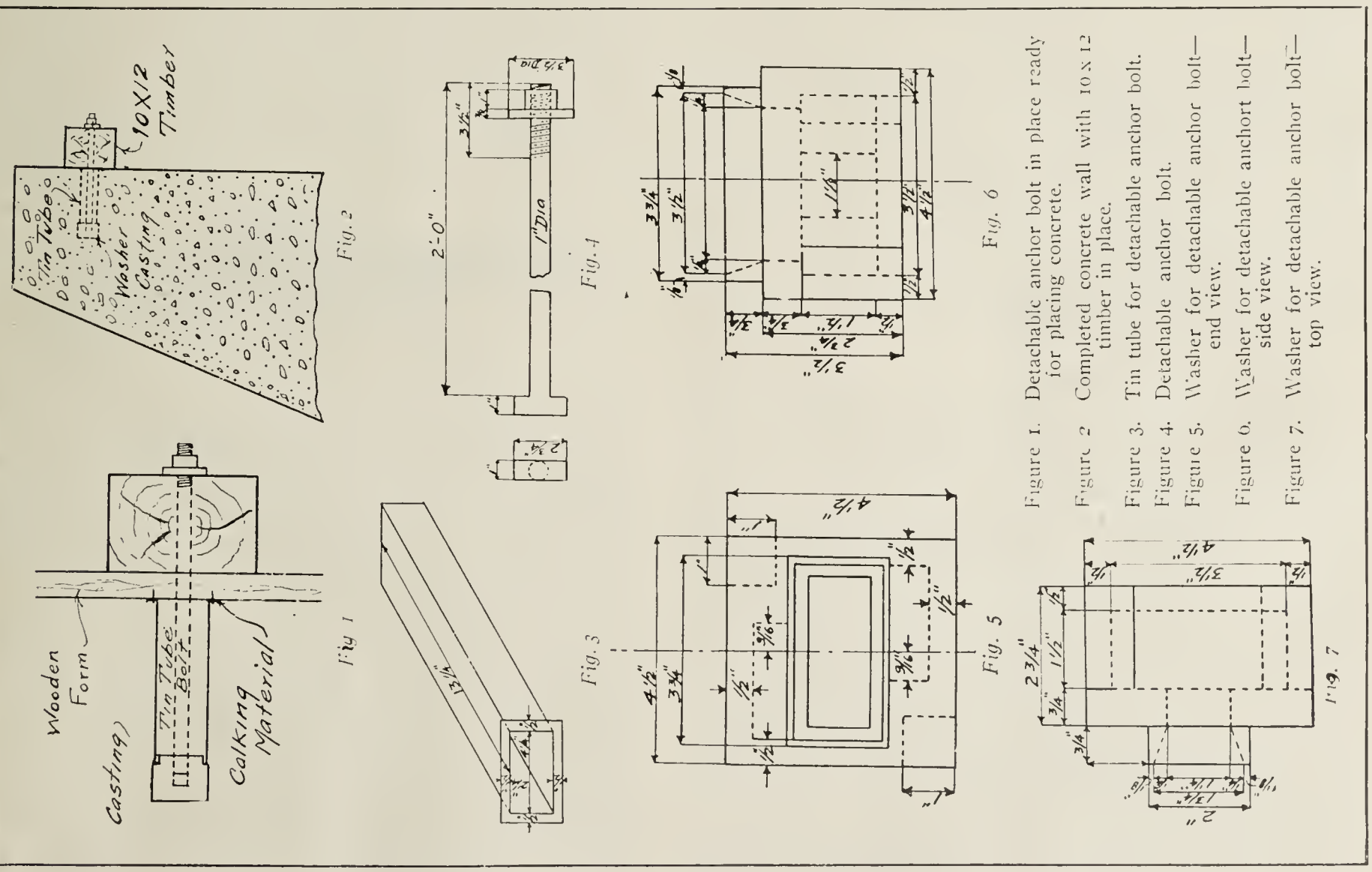
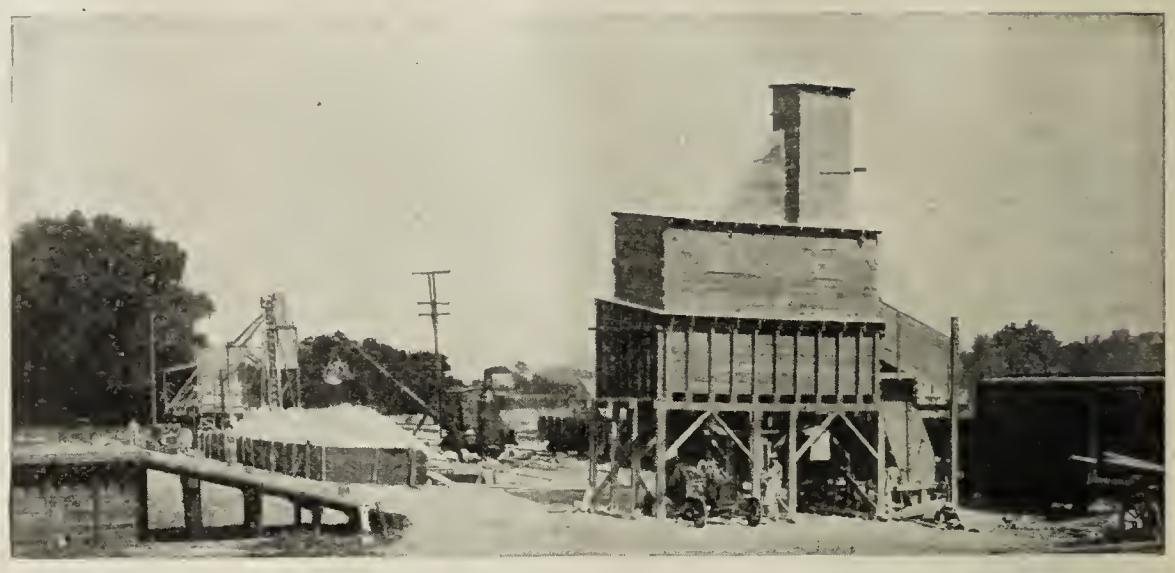


Figure 1. Detachable anchor bolt in place ready for placing concrete.
Figure 2. Completed concrete wall with 10 x 12 timber in place.
Figure 3. Tin tube for detachable anchor bolt.
Figure 4. Detachable anchor bolt.
Figure 5. Washer for detachable anchor bolt—end view.
Figure 6. Washer for detachable anchort bolt—side view.
Figure 7. Washer for detachable anchor bolt—top view.

A Well Planned Central Loading Plant on Spencer, Iowa, Street Job

By W. L. Fahey, City Engineer, Spencer, Iowa

A well systematized and smooth running job of concrete street construction is going on in Spencer, Iowa, the county seat of Clay County. The contractors, J. S. McLaughlin & Sons, of Red Oak, Iowa, secured early in April a contract for paving 95,865 square yards of streets with concrete, and immediately set about building up a plant and equipment to handle the work economically. In working out the plant the contractors sifted out carefully every possibility for delay, figuring that item as the chief obstacle to quality of work desired. Each item of the entire plant was studied with a view to minimizing the number of breakdowns and the need for repairs.



Stone and bulk cement bins of central proportioning plant

Sand bin of central proportioning plant on Spencer, Iowa, concrete street job

They expected a scarcity of labor and designed the plant to use the smallest number of laborers and to get the most out of mechanical equipment. Working from the idea that to have clean materials, aggregates should not be stored on the subgrade, the contractors designed a central loading plant for small trucks which were to deliver the material in the correct proportions directly to the skip of the mixer. While the preparation of the subgrade was going on three large bins and a shop building were erected on vacant property alongside a railway siding. One bin was for stone, one for bulk cement and the third for sand, while the shop is for truck repair and storage of tools and miscellaneous materials.

A Byers auto crane, equipped with a clamshell bucket, lifts the crushed stone from gondola cars on the siding and deposits it over a wood box tunnel a little above ground level. The tunnel is equipped with gates or trap doors operated from below by short-handled levers. The stone falls through these gates upon a conveyor belt that carries the material to a bucket elevator, which in turn empties it into the top of the loading bin. From the bin the stone runs by gravity into a measuring box which is mechanically emptied into trucks.

Bulk cement is delivered to the cement bin in freight cars, which are unloaded by a power-driven scoop. The cement is carried to the top of the bin by bucket conveyors and is measured in a box before emptied into the trucks.

Sand is handled in much the same manner as the stone. As the source of supply is local, the contractors use their own 5-ton motor trucks to haul it from the washing plant to the bin. The loaded trucks run up an incline onto the platform, dump their loads, and the sand is carried by belt conveyor and bucket to the bin, from which it is measured into the trucks.

Electric motors supply the power which operates the conveyors and elevators for each bin. This unusual arrangement for plants of this sort has proved eminently satisfactory and economical.

Materials are hauled from the loading plant to the mixer by a fleet of ten standard Ford trucks with specially designed bodies. These first receive the correct amount of sand at the sand bin. They then pass under the cement bin, receive there the right amount of cement and proceed to the stone bin, where the correct volume of that material is loaded on top of the cement. The proportions being completed, the loaded trucks proceed to the mixer over a haul averaging about a mile. Traveling on the subgrade, they back up to the mixer, dump the material into the skip and return to the plant.

The boss mixer is equipped with a drum having a rated batch capacity of 28 cubic feet. Only 24 cubic feet are carried in the trucks for each batch, and the concrete resulting is well mixed during the one-minute period specified. The proportions 1:2:3 are rigidly adhered to, the cement content being 1.7 barrels per cubic yard. On July 8th a check was made of the amount of cement used in the first 13,000 square yards of paving and it was found to exceed requirements by approximately 2 per cent.

Records show that an average run during a 10-hour day produces 1,200 square yards of finished pavement. The high run has been 1,580 square yards. This accomplishment is all the more remarkable because integral curb is being built at each side of the pavement, and the pavement is being reinforced with steel rods. The section is 6 inches thick, one-course construction. Reinforcing is 2 inches from the finished surface. The roller and belt method of finishing is employed and

precautions are taken to prevent too rapid drying out of the finished pavement, by a covering of earth kept wet.

In terms of man power, there are 47 men employed in the different operations from the arrival of the material on the cars to the finished pavement. The loading plant has one foreman in charge and a mechanic, two men at the stone bin, two at the sand bin and three at the cement bin. Two machine operators handle the crane clamshell and there is a driver for each of the ten Ford trucks. At the concrete mixer there is a foreman in charge, two mixer operators, two men at the skip of the mixer, two at the chute, three concrete spreaders or graders, two placing the steel reinforcing, five performing the finishing operations, and two on the roller and belt. Five men are busy covering the finished pavement, watering it and removing the forms, and there are two helpers assigned to miscellaneous duties, thus distributing labor efficiently.

When a contract of this size is let and the contractor can plan equipment of this nature to handle it, the work can be done at smaller cost and completed in a shorter time. The carefully devised arrangement which McLaughlin & Sons have built is simple and the entire equipment is neither elaborate nor expensive. It has decidedly proved its value, both to the contractors and to the municipality.

Great Hand-Power Bending Tool

A difficult problem solved at last to the complete satisfaction—that is the story of the tool here illustrated.

Economical methods in construction work depend, to a large extent, upon the working devices and equipment provided engineers and contractors in the various departments of work. For example, the problem of bending cold materials readily and adaptively into every conceivable form and shape required for purposes of construction was for many years of deep concern to building interests. Particularly has this been true since concrete construction has become one of

the world's largest and most necessary industries. In the various forms and possibilities of concrete construction, there exist an almost endless variety of uses to which steel bars, piping, etc., are put; and the possibility of extensive and adaptable use of these materials depends solely upon the apparatus or equipment provided for bending them into usable form.

During the last few years, great progress has been made by the Waterloo Construction Company, Waterloo, Iowa, in providing bending tools for all varieties of work. Among the latest achievements in this line is their No. 2 "U" Bending Tool, (shown herewith), which sells at a price within easy reach of even the smallest contractor, and which is practically indispensable to every well-regulated construction enterprise.

New Cement Mill in the South

The Gulf States Portland Cement Co., Demopolis, Ala., has purchased the plant of the Warrior Portland Cement Co., at Spocari, Ala., one mile east of Demopolis, on the Southern Railway and the Warrior River. The officers of the new company are: R. C. Lubiens, of St. Ansgar, Iowa, president; George D. Dieckmann, formerly of Mason City, Iowa, vice-president, and Ralph Law, also of Mason City, secretary.

The active management of the company is under Mr. Dieckmann, as general manager. He was chief chemist of the Northwestern States Portland Cement Co., Mason City, Iowa, for the last 12 years. E. M. Confer is plant superintendent. A. F. Miller, Jackson, Mich., is the consulting mechanical and electric engineer of the company.

Modern Rock Crushing Plants; Dust Collectors

The Allis Chalmers Manufacturing Co., Milwaukee, Wis., are circulating bulletin No. 1411 on "Modern Rock Crushing Plants" and bulletin No. 1454 on "Dust Collectors." Modern Rock Crushing Plants is a well illustrated pamphlet giving good argument as to the performance of the company's ore breakers, revolving screens, elevators, hoists and other machines used in the crushing industry. Sectional elevations of a number of plants at present in operation are also included. The Dust Collector bulletin is of the same high quality and purpose and presents the company's method of elimination of dust in the design of plants to manufacture or produce material with much fines in it.

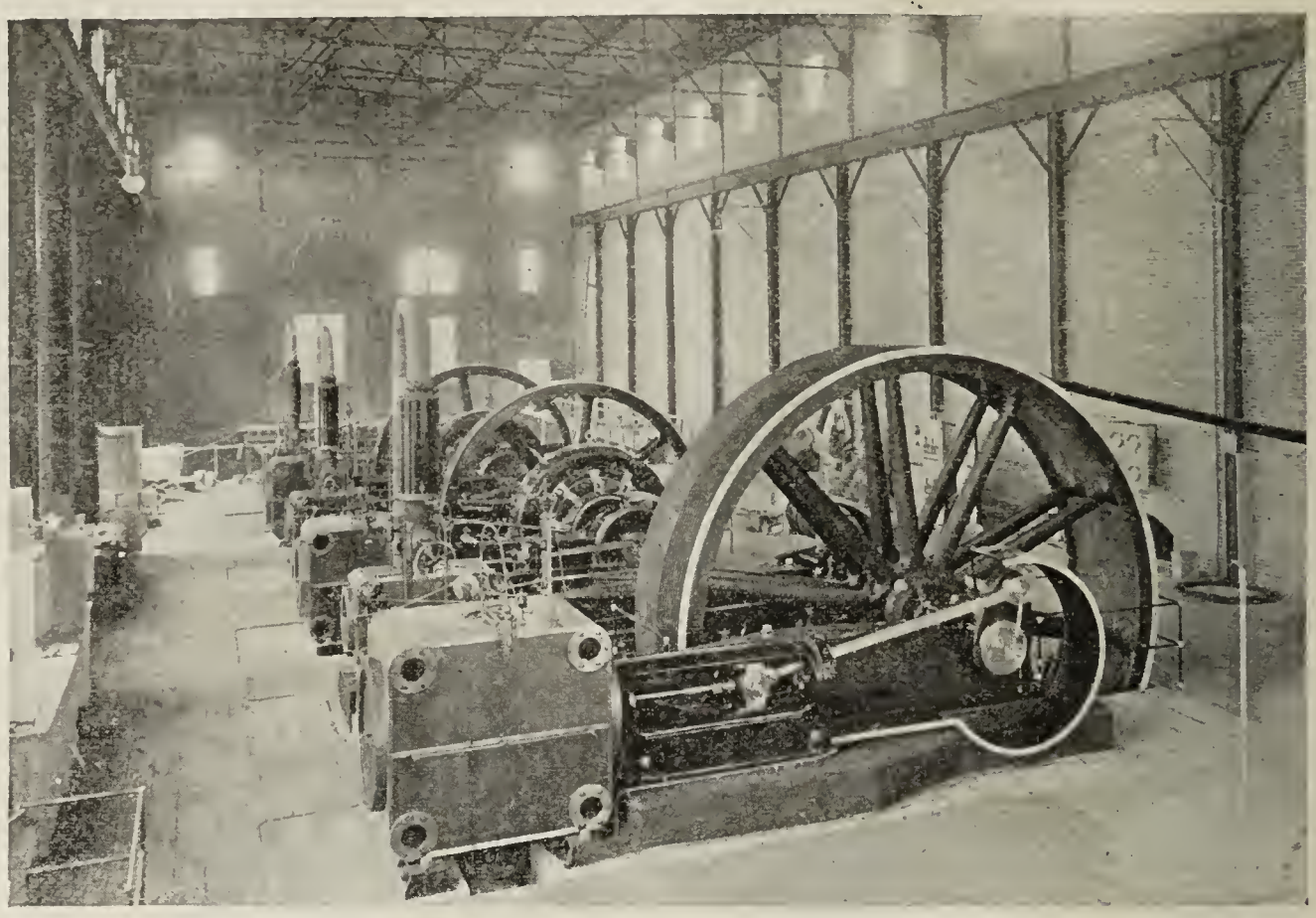
New Bulletins

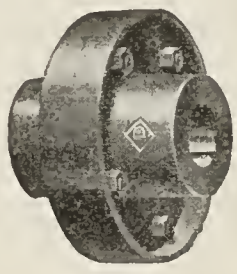
Allis-Chalmers Mfg. Co., Milwaukee, has issued two bulletins, one of them relating to the dust collector of this make and the other to modern rock crushing plants. The first will be especially interesting to manufacturers whose establishments are occupied with grinding and handling fine, dusty materials, because the highest efficiency is impossible where men and machines have to work in a dusty atmosphere. The second bulletin is descriptive of the machinery and appliances that, in connection with the Allis-Chalmers-Gates rock and ore breakers, constitute the equipment of a rock-crushing plant. Both of these bulletins are admirably illustrated, and the pictures are accompanied by full information concerning the several productions.

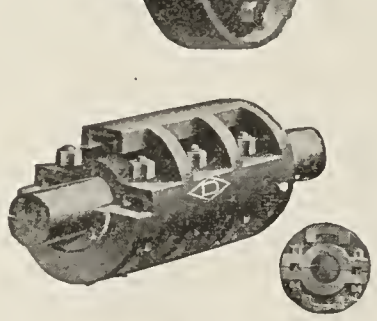
New Cost Accounting Plan

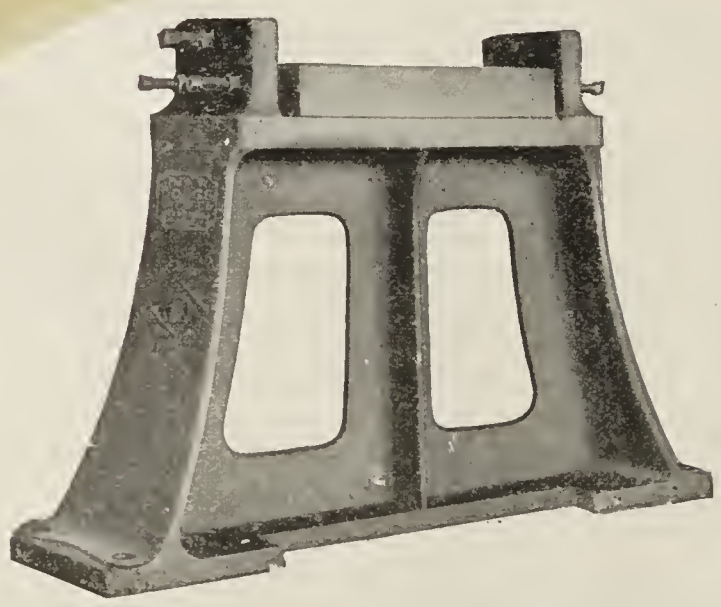
"We recently had an expert accountant put in a new set of books for us as a result of which we are now better able to tell what we are doing from month to month," Geo. L. Sheets, of A. C. Henkle, Building material dealer, Washington, C. H., Ohio, informs Building Supply News. Mr. Sheets is enthusiastic over the local outlook for construction, the valuation of residences and new construction in sight approximating eight hundred thousand dollars. The greatest difficulty in the local situation is the sale of cement by two manufacturers to local block-makers, who have no right to be considered as legitimate dealers. As a result of such direct selling cement prices have been forced down 25c on a barrel. The maintenance of an excellent district association is having an excellent effect in that vicinity.

600 horse power main engine drive









Dodge Equipment Means Lov

Dodge rope drives are used on the prime movers and in important power centers throughout many of the largest and best equipped cement plants in the country.

There are five good reasons for their economy and efficiency in these plants.

First—A substantial saving in first cost of a rope as compared with a belt. Incidentally, replacements of the rope cost only a fraction of the price of belt replacements.

Second—Greater traction and less slippage.

Third—Longer life. This is particularly evident in places when there is free lime or dust.

Fourth—Adaptability. Dodge rope drives are easily installed over, under and around obstacles. They transmit power to points a long distance from the prime mover and are easily arranged to run shafts at right angles to each other.

Fifth—The long experience of Dodge engineers in planning cement plant installations and the unusual facilities of the Dodge plant for building the necessary machinery, insure prompt delivery of machinery that will give you faithful economical service.

Dodge Sales and E

Distributors of the products of the Dodge M

General Offices: Mishawaka, Ind.

Dodge Brai

New York Chicago Philadelphia Bostor
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Cement and Engineering News

Vol. 32 Chicago, February, 1920 No. 2

"I Am Concrete"

By D. C. Steadman

(With apologies to the author of "I Am the Printing Press")

I am concrete, born of the bone and sinew of earth. The epitome of centuries is mine. I have served when the hosts of Pharaoh perished in the Red Sea. I have survived the wreck of an ancient civilization.

I span flashing streams and broad rivers, leap the pale green chasm of ocean straits. Iron mammoths glide across my face, so the tide of modern affairs may hurry on.

I am everywhere—in the chill twilight of the north; in tepid lands that thrill with commerce in the indolent climes of the coffee berry; in the dim, lone regions farthest south. The hot face of the desert has known me.

I resist the carborundum of time, the chemistry of the elements, the corrosion of the sea.

I am the last stronghold in the hour of invasion.

I defy the genii of wind. I have overthrown the splintering demon that shot through the cord of Franklin's kite. I know not the rot of rain.

I have given to the dairy barn the gift of cleanliness, standing guard against the onslaught of slithering creatures that gnaw at the gates of Sanitation.

I am a monument to Endurance.

I have wrested the land from the greedy wash of rivers and have restrained the salty encroach of ocean tides.

I withstand the recoil of snarling guns when all other elements fail. I have deposed the god of fire.

I have sucked at the stagnant heart of swamps. Barley and wheat have sprung forth at my behest, where flourished only the marshflag and the reed. I have aided in bringing water to the desert that it might bloom.

I lend color and charm to the boulevard, grace to the street and dignity to the lane. I make cities beautiful.

I have ironed the ruts and wrinkles off the face of the land, and have smoothed the way for traffic; thus have I benefited all peoples.

I have lent my hand to wireless.

I am the magic compound that has fashioned the backbone of empires; above reproach, beyond disintegration. There is nothing more permanent than I, unless it be truth.

I am Concrete.

Editorial

Push the Post Business

The concrete post business is in urgent need of some concerted development work.

Post machine manufacturers, cement manufacturers, and others interested in seeing the full possibilities of this product developed, should get together and push. And we can be depended upon to do our share.

The business needs, too, some good energetic manufacturers who will go into it with all their spirit and energy, to develop it into a paying business, rather than making posts as a side line and allowing the demand to come in as it will. The field for the concrete post is a wonderfully promising one, but it has never been any too energetically cultivated by the manufacturers.

We are convinced of nothing more fully, than that there is a good market for the concrete post and a good profit in making them if undertaken in the right way. But it is a field which must be cultivated by a unified effort, an effort which is concentrated on this one thing and not scattered over a number of different products. This is no time for internal arguments nor of petty competition among ourselves. Let us all get together and push the concrete post.

Nothing Like Experience

The man who is enthusiastic about drainage work is the one who has participated in its benefits. However hard it may be to induce land owners to form a drainage district in the first place, it is usually an easy matter to get them to tax themselves to improve the district once it is put in operation.

In some respects the most valuable part of a state is its marshes; and yet they can be bought for a merely nominal sum because they are not producing anything of marketable value.

Run a few lines of concrete tile over an acre of such ground, however, give the tile an outlet, and lo! you have a garden spot of unsurpassed fertility.

Winter Is the Time to Make Concrete Products

Practically no concrete products plants are now built without some provision for heating, so that work can be continued through the winter if the demand is sufficient to warrant it.

And the demand is going to be sufficient, if it has not reached that point already.

The history of 1919 in the concrete products business has been, in most localities, that the market has exceeded the ability of manufacturers to produce the material. There is every reason to believe that the coming year will show at least as great a demand.

Why not be prepared for it? Why shut down a plant during the winter, and then see profitable business going away from you in the spring because you are unable to make deliveries when wanted?

The concrete tile business has settled down to a steady, dependable demand. The records of each plant will show what sizes are most used. Work on these sizes during the winter. Get a stock in the yard so that you can tell a prospective customer that you have the goods all ready to deliver. That will make a hit with him, if he is in a hurry to get the work done.

In a great many localities the demand for blocks is also greater than local manufacturers can supply. Standard sizes should be made up during the winter, ready for quick deliveries when the construction season opens.

If a manufacturer's capital is not sufficient to finance two or three months of work with little income, he should make arrangements right now to increase his capitalization and put himself in a position where he can do this and meet his obligations promptly.

All plants must ultimately come to the all-year basis. The first ones to do it will reap the greatest benefit.

Farm Residences and the National Conference on Concrete House Construction

The following committee on farm residences, known as Subcommittee A, of the Committee on Architecture and Design, of the National Conference on Concrete House Construction, has been appointed to study the subject of farm residences in connection with our national housing problem:

J. K. T. Ekblaw, Chairman, Farm Engineering Editor, Orange Judd Co., Chicago.

W. G. Kaiser, Secretary, Farm and Cement Products Bureau, Portland Cement Association, Chicago.

J. B. Davidson, Professor of Agricultural Engineering, Iowa State College, Ames, Iowa.

F. W. Ives, Professor of Agricultural Engineering, Ohio State University, Columbus, Ohio.

J. L. Strahan, Professor of Agricultural Engineering, Massachusetts Agricultural College, Amherst, Mass.

Daniel Scoates, Professor of Agricultural Engineering, Mississippi Agricultural and Mechanical College, College Station, Tex.

Miss Mabel Sensor, Home Economics Editor, Dakota Farmer, Aberdeen, S. D.

The committee will report at the National Conference on Concrete House Construction, which has been called to meet from February 17 to 19, inclusive, at the Auditorium Hotel, Chicago. At its first meeting, held December 30 at the Great Northern Hotel, Chicago, the scope of its work was outlined, and the need for farm homes discussed. It was recognized that agriculture is now in keen competition with industry for the country's best workmen. The economic value of good tenant houses will be comprehensively analyzed in the committee report. Plans will be presented and the necessity for permanent construction developed.

On our farms, shortage of houses is reflected in the inadequate accommodations for desirable farm labor, with the natural consequences that more than ever before the farmer is keenly feeling and suffering from a labor situation.

National Highway System a Need in "See America First" Campaign

The demand for a national highway system has found expression during the past week in an unexpected quarter. Resort hotels have taken up the

slogan, "See America First," in the hope of stimulating travel to offset the loss in revenue which has resulted from the shut-down in the liquor traffic and the consequent closing of hotel bars. To make such a campaign result in a permanent increase in travel, it is now recognized as never before that a trunk line system of national highways is the first important step.

When the slogan, which the public is now getting behind with renewed vigor was first presented, the primary purpose was to stimulate pleasure travel on railways. With the knowledge that America can be seen to best advantage from a touring car, traveling by easy stages and with ample time to stop where nature lures to refreshing side trips, the larger functions of the public highway become more distinct. Oddly enough, it appears to have remained for prohibition to put in a good punch for road development on a comprehensive scale, a result which even the most ardent dry advocates failed to include in their predictions of national benefit.

Advocates of a national highway system, to be constructed and maintained under federal control, have been keeping in close touch with congressional action and are prepared to press the Townsend Bill (S. 1309) to a conclusion during the coming session. This measure, it will be recalled has already been introduced in Congress by Senator Townsend, Chairman of the Senate Committee on Post Offices and Post Roads. It proposes to create a Federal Highway Commission for the express purpose of taking over such lines as may be designated as a part of a national system, and to construct such highways upon a basis that will not only insure the sound investment of highway funds, but to create a system of highways nation-wide in their structure which will serve not only as the backbone of a perfected highway transportation system in itself as an auxiliary to the railways, but which by example will lead to better construction of state and county lines connecting therewith.

Highway officials and others interested in the adjustment of the public road to all types and conditions of traffic, long or short, are pleased over the fact that the public locally is beginning to see the advantages that will accrue to every community through the flow of long distance travel. It has been a theory, national highway supporters assert, that the building of roads for tourist traffic, so-called, would in no way benefit the man who is in need of more dependable roads to his local market. But wherever tourist traffic has been given an open road, local trade has increased, both for the farmer who has produce to sell and for the local merchant as well. Instances of this phase of highway travel are found all along the main routes across the country, and new stopping points for motorists are developing thus supplying greater stimulus to local trade.

The movement inaugurated to increase nation-wide travel promises to profit those who travel far more than those to whom mere coin is paid for such personal service or comforts supplied along the way.

"From-Farm-to-Table" Week

Considerable interest is being centered in the Farm-to-Table Movement. The entire machinery of the Government is actively engaged in trying to reduce the high cost of living, and just now, with conditions as they are, no movement could be more appropriate or important than from the farm to the table.

Much has been said on road-side marketing and, in some parts of the country, it has developed to quite a degree and with such great success that everyone is now urged to utilize their motor trips into the country to purchase produce from the farmer at his gate, thereby establishing a profitable and close relation between the farmer and the consumer. Hundreds of thousands of motor trips are taken every week for recreational purposes only. The Farm-to-Table Movement urges the motorists turn these trips to good account in a utilitarian way by purchasing eggs, butter, poultry, fruit and vegetables at the farmer's gate, for at the present time a very small percentage of these motorists ever stop at a farmer's gate to purchase supplies. One reason for this is that the farmer does not display or advertise his produce.

It is therefore hoped that all organizations throughout the country will take up this movement and encourage the farmers to establish road-side markets and place signboards at their gates showing what they have to sell. The motorists will not only be able to purchase fresh country produce, but he will also establish a feeling of mutual benefit and good fellowship.

Individually and through your organization will you not give this excellent movement as much publicity as possible to make it most effective?

Motor Trucks as Railroad Branches

The attitude between the railroads and the motor truck is gradually turning from a spirit of competition to a spirit of co-operation.

The present serious financial condition of the railroads and the increased freight rates that will inevitably follow, together with the economic advantages of the motor truck, point to a very favorable effect on the prices of foodstuffs as a result of that co-operation.

The use of trucks as feeders to the railroads up to a distance of a hundred miles will release their facilities for the increasing tonnage that requires long distance haulage. It has been specifically proven that because of the duplication of handling in railroad transportation, goods can be shipped on short hauls more economically by motor truck. In a few years the truck will be the standard method of short distance hauling. By acting as a feeder within a radius of terminals, it will provide the railroads with an increased tonnage and assist in making complete delivery, since it will penetrate areas that are now without transportation facilities.

The Big Four freight houses in Cincinnati have set the example. Two motor truck chassis and about ten bodies were used with tremendous success in relieving the railroads of a large tonnage of short haul traffic. Branch stations received the bodies which were filled and loaded on the chassis. On a fixed schedule, they were brought to the terminals and their contents transferred to through cars. Under the old system, cars had to be sent to each of the branch stations and brought to the terminal by the engine, seldom more than a quarter filled.

The advantages of this plan over the old extravagant methods are so vivid that other large cities throughout the United States are realizing the tremendous potentialities of the truck as a feeder to the railroads, and are establishing similar systems.

The time will come when each and every motor truck that operates within a fifty-mile radius of large cities will be in effect a branch line of that railroad. The reason for this is that a railroad requires an immense initial investment for right of way, grading, bridges and rails, and is limited in the amount of traffic it will hold. If such a branch line does not pay for itself, it cannot be diverted. On the other hand, a motor truck route has no limitations and can easily be transferred to a more profitable route if one does not prove successful.

Aggregate Shortage in 1920

Nearly One Hundred Per Cent Increase in Production of Aggregates Needed to Carry Out Construction Program

A survey of the probable requirements in 1920 for sand, gravel and crushed stone has emphasized the great need for co-operation among the producers, the carriers, the engineers and the contractors in order that the supply of these very essential materials may be at all adequate to meet the demand that will come this year in the highway, the building and the other divisions of construction. A very interesting statement on this subject has been issued by the National Association of Sand and Gravel Producers, from which the following account is abstracted.

During the year 1916, according to the report of the Geological Survey, there were produced in the United States mineral aggregates approximately as follows: Sand and gravel, 90 million tons; crushed stone and chatts, 50 million tons; total, 140 million tons.

This was the largest production of these materials that has been reported, either previously or subsequently.

In the same year the sum of $136,000,000 was spent for surfacing roads, exclusive of municipal paving, for which work it is estimated that 40 million tons of aggregates were used, leaving 100 million tons for all other purposes.

According to figures contained in a letter recently sent out by Mr. Thomas H. McDonald, director of the Bureau of Public Roads, addressed to the State Highway Departments, there is actually available for expenditure on highway construction in 1920, $633,000,000, which, at an average cost of $20,000 a mile, will build 31,650 miles of roads, requiring 125 million tons of aggregates.

Prospective Construction Work

This road building program for 1920 does not take into consideration street paving nor the maintenance of existing highways; neither does it comprehend the aggregates that will be demanded for the erection of buildings, railroad improvements (including ballast) nor the many other purposes for which sand, gravel, crushed stone and slag are employed.

Because of the curtailment of general construction and maintenance work during the last three years, it can be estimated that there will be a demand for at least a 50 per cent greater supply of aggregates for such purposes in 1920 than for 1916, that is, a total of about 150 million tons.

On the basis of the foregoing figures, therefore, a total of 275 million tons of sand, gravel, crushed stone and slag must be produced in 1920 if the prospective construction program for that year is carried out, or an output of almost 100 per cent over that for any previous year.

Transportation the Controlling Factor

Mr. McDonald sets forth in his letter that the principal factors on which the accomplishment of the highway program for 1920 depends are as follows: (1) Supply of materials; (2) Shipping facilities; (3) Labor supply; 4) Contractors' organizations.

These four elements of uncertainty apply to other types of construction work, as well as to highway building, while it is obvious that the controlling factor is transportation. It would be useless to increase the capacities of the plants producing mineral aggregates unless at the same time adequate transportation facilities were made available for the movement of such materials.

It is apparent that there must be the greatest degree of co-operation between all parties concerned, including producers, contractors, highway departments, private and public consumers and the railroad authorities, if the delivery of materials required to carry on this huge construction program is made possible. In the first place, existing transportation facilities must be employed in the most efficient manner. To this end it is well to consider how each interested agency may help to meet the situation.

What Highway Officials May Do

The more important ways in which highway officials can assist in securing a maximum use of existing facilities are these:

(1) Award contracts in the winter months, so that delivery of materials may begin early in the spring when usually open top cars are plentiful.

(2) Where laws will permit, allow estimates on delivered materials, whether in storage at unloading station or on the site of the job.

(3) Award highway contracts in long stretches, so that contractors will be justified in providing equipment for handling materials expeditiously.

What Contractors May Do

Contractors and other consumers can help materially by adopting these practices:

(1) Arrange for early and regular delivery of materials.

(2) Provide for storage at points of delivery and on site of job whenever practicable.

(3) Unload cars promptly, using special equipment for such purpose when conditions warrant.

The producers of mineral aggregates are entitled to the same rights and privileges with respect to transportation as the shipper of any other commodity, though, heretofore, they have been the first to feel the pinch whenever an emergency arose. This is not as it should be and the National Association Sand and Gravel Producers, through its transportation committee, is exerting every effort to bring about a correction of the injustices with respect to transportation privileges that have been accorded the industry during the past few years.

Westinghouse Employes Co-operative Store

The employes of the Westinghouse Electric & Manufacturing Company have opened a co-operative store where employes can buy provisions at cost.

The large storeroom or distribution depot has been secured at 709 Braddock avenue, East Pittsburgh, Pa., just opposite the general offices of the East Pittsburgh works. At this distribution depot employes can purchase standard commodities such as flour, ham, bacon, coffee and canned goods. Other standard commodities will be added from time to time as the demand becomes evident.

This co-operative buying scheme is managed entirely by a committee of employes. The movement is endorsed by the management of the company, which has placed with the committee its facilities for placing orders with a standing credit where provisions can be purchased at the lowest cost. The co-operative buying will be done on the cash and carry basis, each person paying cash and carrying his purchase home.

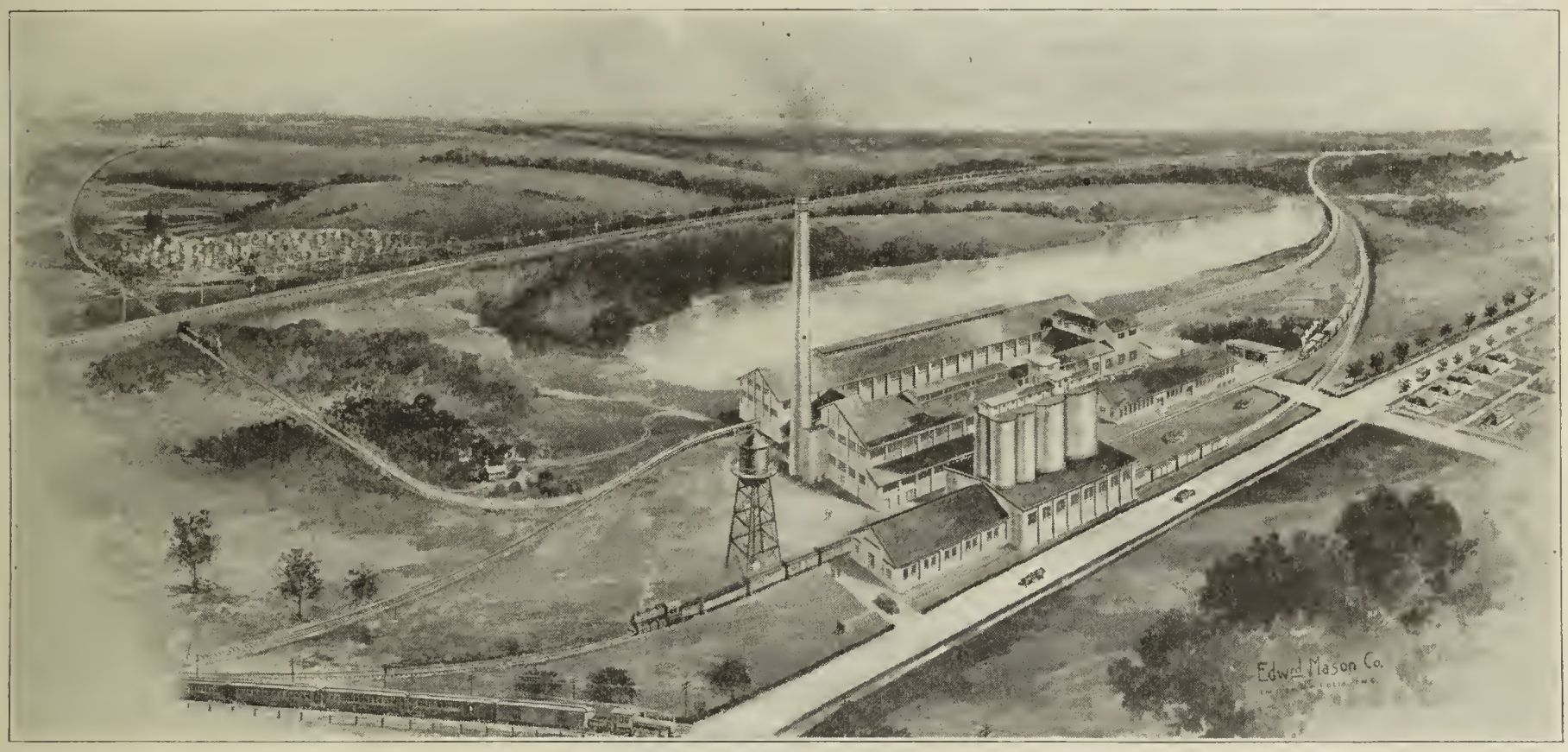
While this plan has just been announced by the committee, it is meeting with general approval and will probably result in quite a saving to the employes taking advantage of it.

New Indiana Cement Mill Now Operating

The Indiana Portland Cement Company's new million dollar plant at Greencastle, Ind., which has been in course of construction for the past two years, has started active operations. The plant has a number of unique features and is one of the largest in the country, having a capacity of 1,500 barrels daily, which will be doubled within the next year. It is electrically driven and has a kiln 240 feet long, requiring 14 flat cars to transport to this place.

F. L. Smidth & Co., 50 Church St., New York, N. Y., designed and built the plant for Adam L. Beck, former president and owner of the Oklahoma Portland Cement Company, Ada, Okla. Associated closely with him is his son Marshal Beck who is acting as treasurer and purchasing agent.

The plant is located just south of Greencastle between the Monon Railroad and the Pennsylvania R. R., and has direct connection with both, as will be seen by referring to the illustration.



The new Indiana Cement plant

It will be noted, for instance, that the storage bins have tracks on each side, under cover, one connecting with one road and one with the other. For the introduction of raw materials only one track is provided, as it is of course, necessary that all cars of stone come in on the same track in order to dump into the hopper which feeds the crusher. But this track connects with both roads.

The construction of the plant is practically all of reinforced concrete, the builders realizing that once the plant is constructed it will be there to stay and give efficient service through a long series of years, so that they are willing to spend the money to have it right in the first place.

One of the unique features of the plant is that the storage of all materials, except the finished cement, will be confined to one building. This is merely incidental, however, to the idea of compactness which is being carried out throughout the entire design. In this storage building will be kept the stone, clay, shale, clinker, gypsum and coal.

The railroad track as previously noted, runs through this building, under it being a hopper into which the rock is dumped from the cars, being fed from there to the No. 20 crusher.

The company has a quarry of its own close to the plant; but it will get a large part of its limestone rock from some of the dimension stone quarries of the locality, who can thus dispose of their waste to good advantage, at the same time furnishing raw material to the cement plant at the mere cost of transportation.

The storage building is completely equipped with elevating and conveying devices, including Jeffrey chain and bucket elevators and elevating and conveying outfits. These also extend to the other parts of the plant, so that the materials are mechanically handled from start to finish. The building is equipped with an electric traveling crane covering all parts of the building.

For carrying off the smoke and gases from the 240 ft. kiln is a concrete chimney, 210 ft. high and 26 ft. in diameter at the base.

The company owns 460 acres of land at this point, which is underlaid with a high calcium lime, as well as supplying the clays necessary for a correct mix.

The plant is designed to operate on the wet process, the equipment including a Smidth clay wash mill, and mixing basin, concrete slurry storage tank, and correcting basin where the mix is corrected to accurate proportions before being pumped to the kiln clinker storage, from which it is carried to the Smidth Kominuter and then to the tube mill for finish grinding.

The storage house for the finished cement is in the form of circular tanks as shown in the illustration. It is drawn from these direct into Bates' Packers, the packers moving on rails the length of the packing house, so that they can be connected almost instantly with any desired storage tank. Two of these outfits will be in use. They run directly under the bins and fill from bottom gates, the bins being on legs for this purpose, so that access may be readily obtained to cars on either track. The two tracks, as previously noted, connect with the two railroads passing through the town.

All machinery is operated by means of Westinghouse motors. The current to supply these is purchased from the interurban electric car line which passes within a short distance of the plant.

Plant of the Northwestern States Portland Cement Company

One of the largest and most complete cement plants in the United States is that of the Northwestern States Portland Cement Company in Mason City, Iowa, having an annual capacity of 2,000,000 barrels. The entire building equipment covers an area of 40 acres.

The materials used are limestone and clay, which are found in almost perfect composition in the vicinity. The quarry, a large one, has been worked up to the very edge of the plant premises. The limestone averages about 97% pure carbonate of lime.

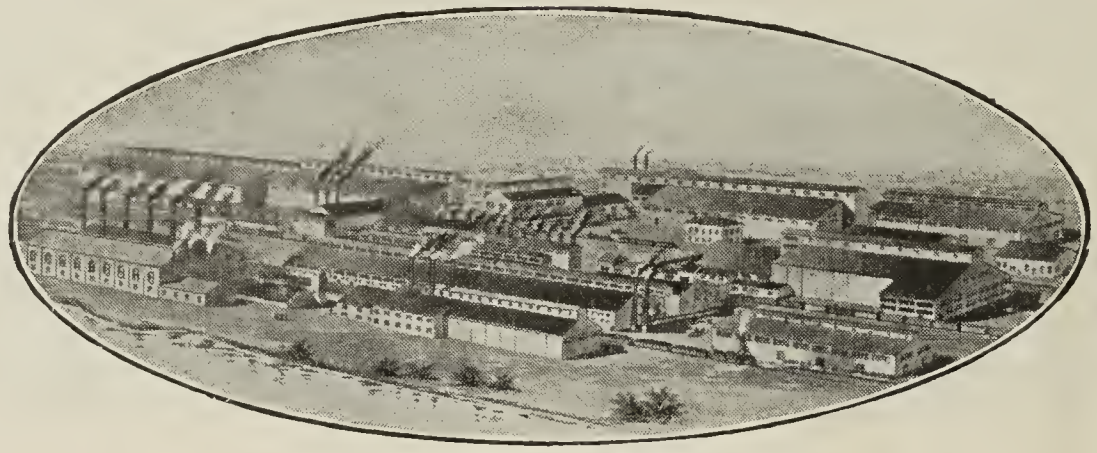
Quarry

The physical characteristics of the quarry are very important. It has both horizontal and vertical seams. The rock comes out easily with very little blasting, and in the form of cubes. Only one or two feet of overburden has to be removed, which is done with horse-drawn scrapers. Three well-drilling outfits are in operation. The holes are drilled about 31 feet apart. One air drill is also used at points where it is not necessary to drill to the full depth of the face.

The rock is excavated and loaded into open-side cars by a Vulcan steam shovel with 3-yard dipper. These cars are then hauled to the plant by two locomotives. There are 43 of these cars in use.

Mill Proper

Rock from the quarry is drawn on the railroad track out to the ground level, and then up an incline into position in front of the crusher plant. Here it is dumped direct from the cars into a chute leading to the hopper of a No. 9 Gates gyratory crusher, which reduces it to 4-inch cubes.



Northwestern States Cement Plant

A bucket elevator takes the product to the top of the crusher building and feeds it to two No. 6 Gates gyratory crushers, which further reduce it to 2-inch size and finer.

Next in order come two Allis-Chalmers crushing rolls, where reduction to one-half inch size and finer is made. Encircling the stone crushing, drying and storage building is a bucket conveyor. This is so arranged that it discharges direct to the bins over the dryers, or into storage. The top run of this conveyor is in the monitor of the building, and the bottom run in a tunnel under the storage pile. The material from the crushing rolls is discharged onto the bottom run. Therefore, the dryers can be fed direct from the rolls or from the storage as desired. The storage capacity is 25,000 tons of stone.

Before the stone can be further reduced it must be dried, which is accomplished in two dryers. The stone is fed into them by Gates oscillating feeders. The dryers are 60 feet long by 6 feet in diameter. They are lined with fire brick and are mounted on two sets of carrying mechanisms, with a slight slope. The furnace is at the lower or discharge end and the hot gases pass up through.

A screw conveyor conveys the dried stone to an elevator which discharges to a No. 6 "Jumbo" mill made by the Williams Patent Pulverizer Company of St. Louis. Then, after going through two Newago separators of a type similar to those now made by the Sturtevant Mill Company, it is delivered to eight ball mills. These ball mills reduce the product to coarse grit, 50% of which will pass a 100-mesh screen. They are lined with steel plates which overlap and form steps or shelves. Inside are 5,000-pound steel balls. The mills are operated at 26 revolutions per minute.

The fine product goes from the ball mills to the dust tank, and the coarse product is returned to the same mills to be again reduced until it will pass the proper screen.

Up to this point the product handled has been entirely rock. Now the clay is to be added for the purpose of making the proper chemical mixture. Where this clay is obtained and the methods of digging it will be described elsewhere. Taking it from the bins into which the cars discharge, it is passed by a belt conveyor to three dry-clay pans, where it is ground, being raised from there into an elevated bin which discharges into three rotary clay driers similar to the stone driers. From them it goes either to the clay storage room or to the mixing station. In the two clay storages there is capacity for 15,000 tons each. For conveying from the dry pans to the bin an ordinary elevator, discharging into a screw conveyor, is used. From this point on, screw conveyors will be used very largely.

The clay in its dry, finely divided form is carried to the point where the stone has entered the dust tanks. In the meantime, the chemist has taken samples at every step at definite intervals, which are tested in the laboratory. He is thus in a position to know the proper amounts of stone and clay to be mixed in order to obtain the proper "raw mix."

The ground stone and the finely divided clay are stored in adjoining steel bins. The two materials are led through shut-off gates through steel spouts to steel hoppers mounted on scales. There are two sets of these scales. The clay is weighed first and then the proper amount of stone is run in on top of the clay. The weighman can see the poise, but cannot tamper with the weights. The chemist, only, has a key to the box containing the scale beams. He tests the scales often for accuracy. Approximately 9,000 pounds of the two materials is weighed per batch.

The clay and stone are now ready for mixing, which is done in an Allis-Chalmers 5 by 22-foot tube mill used as a mixer and containing only a few balls. The

product so obtained is the raw mix and it passes into 14 Gates raw tube mills for finer grinding and mixing. These mills are worked in two ways: Part of them with Manganoid steel balls, furnished by the Jeffrey Mfg. Company, in which case they are lined with steel and about half the interior being screened off to contain the balls. Part of them are lined with Silex, and Danish pebbles used. In this case there is no dividing screen. The resulting mixture is fine enough so that 97% or better will pass a 100-mesh sieve.

The raw mix is now ready for the kilns, which are located in a separate building. It is carried by screw elevators to tanks, located one over each kiln, of which there are 12. The product is fed to the kilns through Gates rotary feeders, and carried through water-cooled feed pipes to the kilns.

In the kilns the raw mixture is calcined, and after the carbon dioxide is driven off, the acid and basic constituents are fused, forming tri-calcium silicates. The fusion takes place at about 2,400 degrees F., and the necessary heat for this is obtained by burning pulverized coal in a manner which will be described farther on.

The kilns are each 7 feet in diameter by 110 feet long, made by the Vulcan Iron Works of Wilkes-Barre, Pa. They are driven from a main line shaft through two clutches for each kiln. This arrangement provides for two-speed operation. They are similar in construction to the stone and clay driers except that they are larger. The sheet-steel shells are nine-sixteenths thick, lined with fire brick. The kilns are supported in a slightly inclined position by roller steel tires, each of which revolves at about a half revolution a minute, on four heavy cast steel rollers mounted in pairs on a rocker. Each kiln, with its lining and charge of mix, weighs about 175 tons.

The clinker from the kiln is conveyed by another conveyor to the clinker storage, having a capacity of 70,000 barrels, and is allowed to age. This conveyor encircles the whole kiln and clinker storage. Another conveyor, only encircling the clinker storage running alongside the above conveyor, transports the cold clinker to the Kent mill building, on the way going through two large rotary Vulcan coolers, which are arranged so that they may take the product direct from the kilns or from clinker storage, through the agency of the conveyor.

From the Kent mill building the cooled clinker is spouted down through an Allis-Chalmers crushing roll, passing into a conveyor and up over to the Kent mill tanks. There are 11 of the Kent mills, whose product is passed through Newago separators. The coarses are returned for regrinding, and the fines pass on to the gypsum station, where this final element to the finished cement is added.

The finely ground material at the gypsum station is passed into a hopper having a capacity of 5 barrels. There are two of these hoppers to allow of feeding and discharging alternately. To each hopperfull a weighed amount of gypsum is added—about 3% of gypsum. A reliable man attends to this station. Both ingredients are weighed, insuring uniformity of the mixture.

The final mixture is now ready for the finishing mills. These consist of 16 Allis-Chalmers tube mills 5 by 22 feet, operating some of them with manganoid balls and some with pebbles. The product from these will, 96 to 97% of it, pass a 100-mesh screen. Tests of the fineness of the cement from each mill is made every hour before the cement enters the warehouse. The warehouses have a capacity of 600,000 barrels.

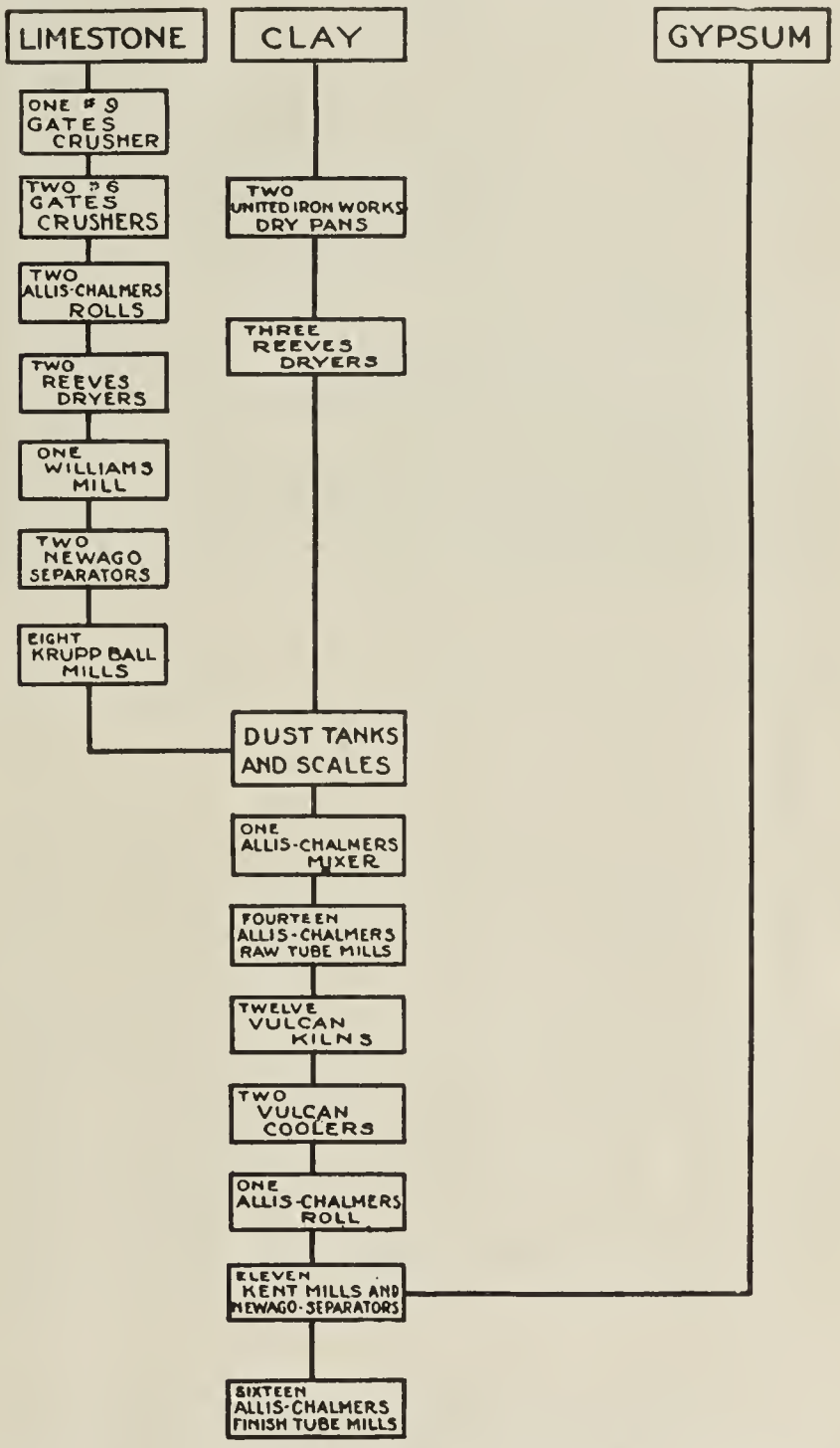
Bagging

A screw conveyor carries the cement from the warehouse to bins over the bagging machines. The old sacks, which are returned, and upon which the usual credit is given to the contractor or dealer are first counted. They are then taken to a mechanical beater, which extracts all the cement clinging to the fabric. It is said that nearly a pound of cement is recovered from each bag in this way.

Bags with small, easily repaired holes are sent to a department where these holes are covered by glueing or cementing patches over them. Others more badly torn are taken to another department where the rents are patched with sewing machines. There are on the average 25 men required in the bag repair department alone.

Clay Workings

The clay fields are located about one and one-half miles southwest of the plant. No stripping is necessary, as the clay immediately beneath the grass roots is suitable for the purpose. A specially designed plow, drawn by a 17-ton tractor, plows up the clay to a



Flow Sheet Northwestern States Portland Cement Company.

depth of about 1 inch, after which it is allowed to dry in the sun. The fields are kept higher in the center than at the edges, to permit of easy drainage.

There are two kinds of clay in the field, and it has been found advisable to use both, properly mixed. One clay is on the surface as above described. It is of a yellowish color. Deeper, there is a blue clay which is excavated and thrown directly into cars by means of a one-half-yard steam shovel.

The yellow clay, after it has been allowed to dry, is gathered up by horse-drawn gathering machines with specially designed revolving cylinders, which load automatically. The teams then drive over a bridge

under which the clay track runs, and the machines are dumped automaticaly into side-dump cars below, to be drawn to the plant. The clay trains run to the plant and up onto a trestle, where the cars are dumped into the bins from which the clay for use is drawn, as previously described.

There are about 80 acres in the clay fields, and on this site is located a clay storage house of about 15,000 tons capacity from which a supply to run the plant for a considerable time may be drawn in case of emergency.

Coal Handling Equipment

Large amounts of coal are required, not only for the power plant but in the kilns and dryers and other parts of the manufacturing process. There is a separate coal building where preparation of the coal for the processes is carried on. Facilities for receiving the coal are uncommonly good, as there are switching connections with the Chicago & Northwestern Railroad, Chicago, Milwaukee & St. Paul, Chicago, Rock Island, Chicago Great Western, Minneapolis & St. Louis, and the Minneapolis, Mason City and Clear Lake interurban.

The building alluded to has among other equipment one Jeffrey roll under track hoppers, two belt conveyors, two dryers, one ball mill and five four-roll Raymond mills.

The whole building is linked with a conveyor which carries the fuel used in the kilns and dryers into storage. A Clark dust collecting system is also installed in the coal building.

The kilns are fired with powdered coal. This coal after being dried and pulverized to a fineness of about 97% through a 100-mesh screen is fed through pipes into the lower ends of the kilns, and blown with a pressure of 4 ounces per square inch through 5-inch pipes. Brown optical pyrometers are used to measure the temperature of the kilns in the firing zones, while the temperatures of the kiln stacks are ascertained by Brown recording pyrometer, with base metal thermo-couple.

Pulverizing the coal for the dryers is accomplished with an Aero pulverizer system, motor driven. This system makes possible the highest efficiency possible from burning coal. The fine dust burns like gas, with a flame, the physical and chemical character of which is regulable—a flame that may be lengthened or shortened, thus placing the zone of higher temperature where needed. This flame may be made oxidizing, reducing or neutral as the occasion demands. Powdered coal and air in regulable proportions are intimately mixed in the pulverizer. The mixing operation commences at the feed end of the pulverizer, where the coal and air enter together, and the pulverizing and mixing continue on together until the mixture leaves the pulverizer, having the appearance of a cloud of smoke.

This impalpable powder, with its theoretical requirement of air, is conducted through a pipe directly to the furnace. There is no coal pulverized except for instant use. Every minute particle of the coal is ablaze within one second from the time it leaves the pulverizer and within one additional second it is completely consumed. Most of the time, less than one-half second is required in each case.

Power Plant

As has been surmised from the foregoing, a great amount of power is required in the operation of a plant of this kind. It would be a city of a great many thousand inhabitants which could boast of an electrical power plant the size of this one.

The plant is located in a separate building.

An average of 88,000 kilowatt-hours per 24-hour day are produced at this plant. The power wiring passes through a tunnel to a distributing tower near the mixer building. Conduit is used on lighting circuits—with condulet outlets. Open wiring is used for power circuits.

The power developed is utilized in the operation of 126 motors, with a combined capacity of nearly 6,500 horsepower. One of these motors is of 200 horsepower. Ten are of 100 horse-power or over. From these they range down as low as 5½ horsepower.

Testing of Materials and Finished Product

Extreme care is taken at all stages of the process to test the materials and the product itself. This is done to insure both uniformity and quality of the product. Moreover, the tests are all made a matter of record. All the necessary facilities are provided, together with a competent staff, and this work goes on night and day, as does the manufacture of the cement. A mill of this kind once started may be said never to stop.

The chemical properties of the clay and rock are known in a general way before they enter the plant. That is, core drill records all over the property were made long ago, and the results indicated on a plot of the ground. These cores were taken every 100 feet in both the rock and clay deposits.

The amount of moisture in the limestone as it reaches the plant is determined four times in 24 hours, from samples taken at a point before it reaches the dryers. These samples are taken by boys who go out at specified times. Samples are also taken four times in 24 hours after the rock has left the dryers.

Next, a fineness test is made after the product leaves both the Williams and ball mills. These tests are made every 2 hours and quickly detect any defects in screens, etc. Then samples of the stone are taken every 2 hours for the determination of the chemical composition.

This concludes the testing as far as the mechanical preparation of the limestone is concerned. The latter is now ready for the addition of the clay.

The clay is tested for moisture at the same intervals that the stone is tested, four times in 24 hours. It is also analyzed for lime contents eight times every 24 hours.

Finally a complete chemical analysis of both limestone and clay is made twice a week.

The limestone and clay having been mixed, as previously described, are tested for chemical composition, percentage of lime, every hour, and for fineness every hour, and of this raw mix a complete chemical analysis is made every week.

The clinker resulting from the fusion of the raw mix is tested for fusibility every hour and frequently every half hour.

The average of day and night clinker is also ground in a laboratory mill with the necessary amount of gypsum added, and a physical test made of the same.

As the material goes through the Kent mills it is tested for fineness four times in 24 hours. The finished product from the tube mills is tested every hour for fineness, setting qualities and soundness.

Long time tensile strength tests are also made. The average of the daily samples for a week are so tested; the average of these weekly samples for a month and so on for periods of 3 months, 6 months, 1 year and 5 years and 10 years.

But as if all this testing and all these analyses were not sufficient, every carload of cement that goes out is individually and thoroughly tested. An authorized representative of the chemist's department takes 10 samples from each car, and these are tested physically and, if necessary, chemically.

Central Proportioning Plant Speeds Up Michigan Concrete Road Work

A few months ago highway engineers and contractors throughout the central states were startled by reports of almost incredible progress being made on a concrete road job in Branch county, Michigan. Phrases such as "four feet of sixteen-foot road per batch," "one hundred feet an hour," "seven hundred feet a day," "a half mile in four days," "three miles in four weeks," have all been used in describing the performance on this pavement contract between Coldwater and Batavia. The records of the contractor and the engineer inspector from the state highway department bear out all these statements. In actual figures of work the mixer had laid 15,847 lineal feet of 16-ft. pavement in 225 hours, averaging 70.4 ft. per hour. The high run was 126 ft. per hour.

If you will conceive a mixer that will mix 55 cubic feet of concrete in a batch, and deposit batches mixed not less than 65 seconds on the sub-grade in rapid succession, you begin to grasp the proportions of this "child" of the brain of G. P. Scharl, the contractor. While this machine is admittedly the most spectacular part of the equipment because of its immense size and capacity, the heart of the organization, the "big end," as Mr. Scharl expresses it, is the central proportioning plant.

Alongside a switch from the main railroad are three material bins. The bin for cement is stationary. Bulk cement is delivered in gondola cars equipped with heavy canvas covers. The cars are ranged alongside the bin and are unloaded by the crane into the bin. The bins for sand and stone on either side of the cement bin are built on flat cars moving on a dead end track. The crane, equipped with a clamshell, is mounted on a flat car, is self-propelling, and shifts the sand and pebble bin cars where necessary.

Material boxes of 55 cu. ft. capacity, one on each chassis of an industrial train, are drawn alongside the gravel bin first, each box receiving 30 measured cu. ft. of stone. Teams move this string of cars ahead, under the cement bin, where 10 measured cu. ft. of cement are deposited in each box. A little further ahead the cars are drawn alongside the sand bin and each is filled with 15 measured cu. ft. of sand, thereby completing the proportion. Pushed ahead, the train of cars is coupled up, ready to be drawn to the mixer by gasoline locomotives.

As the distance from the proportioning plant to the mixer increased the delivery became more difficult. With the addition to the equipment of a third gasoline locomotive, however, there is now practically no difficulty in keeping the mixer supplied. The short rest periods gained by the workers about the mixer are well earned, whenever such a delay occurs.

Arrived at the mixer, the material boxes are lifted from the truck by a motor derrick, swung into position over the hopper of the mixer and there emptied by an ingenious contrivance, worked by the derrick operator. This dumping device, together with the material boxes, were designed by Mr. Scharl, the boxes themselves being constructed in his own field shop.

The giant mixer is the result of some years of development and was designed by Mr. Scharl and built at his special order. It is not self-propelling, but is moved forward by the tractor on which the derrick is mounted. The mixer weighs approximately twelve tons, but the great width of the tire of the wheels makes planking of the sub-grade unnecessary.

Standard methods of finishing and curing are followed, a steel shod template strikes the concrete to the required crown, a roller presses out excess water, the finish is secured with a wide canvas belt, the surface on each side of the joints is brought to exact level by a 4-ft. split float. An edging tool is used at the sides of the pavement, canvas covers are placed over freshly laid sections during hot weather, and one day's run is covered with 2 in. of wet earth by noon on the following day.

Finished sections of the pavement are opened up to traffic after about eighteen days of curing. The best practice has been followed on curves, as they are all widened and super-elevated. The water supply is pumped from a running stream and no difficulty is experienced in getting enough water for the mixer.

The business end of Branch County concrete road work showing aggregate cars being lifted off their trucks preparatory to the discharge of their contents into the mixer.

The great road building program, which is only just opening up, is attracting to the work a number of large contractors. The tendency is increasingly toward contracts for longer stretches of pavement. The day is coming when road paving contracts will be let in stretches of 20 miles and more.

In view of this fact, such equipment as has been devised by the contractor on this paving contract is attracting the attention of highway engineers and of contractors, not only from this section of the country, but from distant points. Almost daily visitors are found studying Mr. Scharl's plant, from one end of the job to the other. This is the highest compliment that can be paid by the engineering and contracting world.

Cement Gun Construction Work

Announcement is made by the Dewey Cement-Gun Construction Co., of Allentown, Pa., that it has been re-incorporated under the name of Traylor-Dewey Contracting Co., and under that name will continue to specialize in numerous types of construction and repair work by means of the cement-gun. In addition to this it is prepared to estimate upon and to construct roads, pavements, etc., as well as plain or reinforced concrete structures. C. L. Dewey is president, R. H. Gillespie, general manager and chief engineer, and W. L. Stancliffe, general superintendent. The increasing use and importance of cement-gun construction following the impressive results obtained in the execution of numerous contracts by this concern makes this announcement of more than usual interest.

How One Contractor Provided Aggregates

By E. A. GAST, Contractor, Warsaw, Ind.

When roadbuilding was largely confined to the vicinity of towns or near railroads, the problem of shipping materials was not what it is today, where the location of the road being improved is often miles from a shipping point. In the past, contractors depended entirely upon the large washing plants and the railroads. They were willing to pay the price of transportation of materials rather than risk the installation of a small washing plant sufficient in size to take care of several miles of road. They felt that the operation of a gravel plant was a special business to be conducted by itself.

The pressure of war conditions, combined with attendant transportation problems, compelled some contractors to install their own aggregate plants. Once started and their success proved, interest was aroused among other contractors to do likewise.

Indiana is favored with large deposits of gravel. If a sufficient supply of water is available, a portable aggregate plant can be erected at a cost which, combined with the cost of a short haul to the road under construction, is indeed small by comparison with the first cost of washed aggregates from a distant plant, plus freight, plus a long haul from a distant railroad point.

It is not the desire of the writer to attempt to prove that under all conditions a portable plant is more economical than shipping in aggregates nor to detract from the part played in concrete road construction by the large commercial aggregate plants of Indiana. Their role is important. But it is believed that many contractors will be interested in the writer's experience with a portable plant near Mentone, Ind., located on a road which is being paved with concrete. The plant also served in the construction of two roads connecting with the road for which especially provided and will serve still another road which is a connecting link, in all a total of more than six miles.

Washing and separating the sand and pebbles used on concrete road work near Mentone, Ind. With the trend toward larger contracts, contractors in some localities might find it profitable to develop their own aggregate supply.

View of aggregate plant operated by Mr. Gast on Indiana concrete highway contract.

The deposit worked is large and runs high in sand. However, by preventing the settling tank from tipping except when needed, the surplus sand is sluiced into a nearby low field.

The plant consists of a grating into which the gravel is scooped, a bucket elevator, a circular screen, a sand settling tank, and bins. Pebbles are graded from ¼ inch to 2 inches, and sand from ¼ inch to fine. A six H. P. gasoline engine operates the washing machinery and a 12 H. P. four-cylinder automobile engine operates the pump, which supplies a 4-inch stream of water from a well near by, ample to wash the sand and pebbles thoroughly. Generally, three teams are at work scooping material into the hopper, but the plant can wash the product of four teams' work. The capacity is 75 cubic yards of sand and pebbles per day. An average of about 60 cubic yards is the output. Trucks holding 4 yards are used to transport the material to the road, two trucks being sufficient to keep the crew busy at the mixer, due to a short haul.

Relative figures show that the cost of the material on the road is about one-third of what shipped material would have cost, laid down on the job.

Only one difficulty was experienced and it has been overcome. The first engine used to operate the water pump was not large enough, but the substitution of an engine which continues to stand the heavy work remedied this.

Reprints of Construction Bulletins

Reprints of the following mentioned bulletins have been ordered:

"Ideal Mortar for Brick Masonry."
"Modern Methods in Concrete Construction."
"Watertight Concrete."

All of these bulletins have been in heavy demand as they have contained information of interest to the engineer, architect and contractor alike. It has been deemed advisable to have reprints made to replenish our present low stocks on hand. These bulletins are distributed gratis to anyone who makes request. Address the National Lime Association, Washington, D. C.

Why Concrete Oil Storage Tanks?

By C. W. Freitag, President and Treasurer Con-Oil Tank Co., Fulton Building, Pittsburgh, Pa.

In dealing with the subject of concrete tanks, like every other large subject, certain variables should be at once recognized, and being recognized, should be either eliminated or discussed, as desired. Therefore, the subject of oil storage should be divided into mineral oil storage and animal oil storage, or storage in which animal fats enter. I understand that it is the purpose of this paper to confine this article to mineral oil storage, not because we are to consider it impossible to store fatty oils in concrete, but because the vast majority of oil in storage today is either mineral oil or a derivative.

Having thus confined ourselves to the discussion of mineral oil storage, I wish to point out in a general way the many advantages of concrete over any other material for permanent storage. What I shall say in this relation is not the result of laboratory experiments alone, but are facts which have developed by long study of the history of concrete oil tanks and by practical experience in the designing and construction of such tanks during the past two years.

Because of a widespread belief that mineral oils will act deterioratingly when in intimate contact with concrete, and to show how groundless this conception is, I wish to state the following:

Concrete Tanks Are Permanent

During the period of 1911-1913 the United States Department of Agriculture, Office of Public Roads, carried on experiments in which 5 per cent by weight of mineral oil was mixed in the concrete to determine whether the oil would assist in making concrete waterproof. These experiments proved conclusively that oil did not cause disintegration of concrete, or in any way prove injurious to it.

In 1905 the San Antonio Gas and Electric Company of San Antonio, Texas, built a 200,000-gallon concrete fuel oil tank, and after ten years' continuous service the tank was emptied and examined, both inside and outside. Absolutely no deterioration could be discovered and the tank was again placed in use. The Associated Oil Company of San Francisco, after having a 500,000-barrel tank in use eight years, found that penetration had not exceeded one-quarter inch, as established by cutting away the concrete, and that the strength was in no way impaired. The Dewey Portland Cement Company of Dewey, Oklahoma, after nine years, found penetration of less than one-half inch and absolutely with no effect upon the strength.

Therefore, if we accept U. S. Department of Agriculture findings, that mineral oil, when intimately mixed with the ingredients that go to make up concrete at the time of mixing and placing, does not in any way affect the resultant strength, how long, then, must we wait for the oil contained in the above referred to tanks, or in tanks constructed with our greater knowledge and improved methods of construction of today to destroy its container by disintegration?

Concrete Tanks Cheaper Than Steel

In figuring the cost of a permanent oil storage installation, one should take into account every item in connection with such storage, such as the original cost of installation, foundations, ground space, depreciation, fire risk, loss by evaporation, maintenance, etc.

One of the largest steel manufacturers, of the Pittsburgh district recently told me that he figured the life of an ordinary steel tank at ten years when buried, or thirty years, with proper maintenance, above gound.

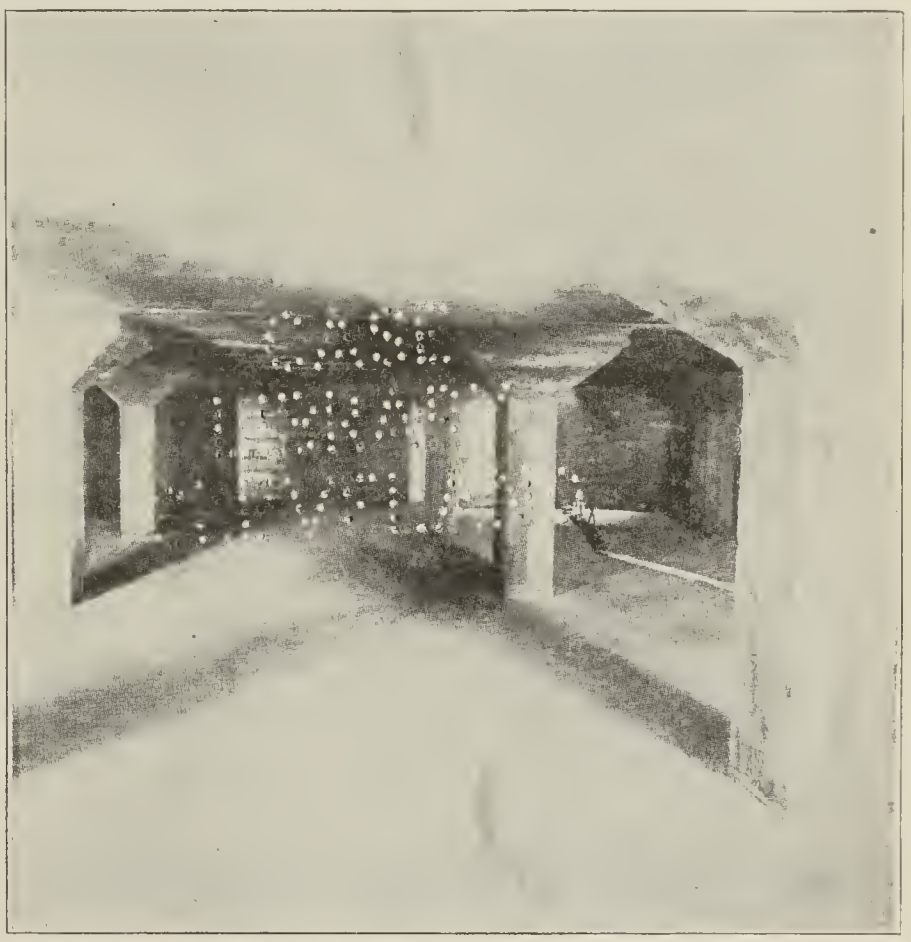
Therefore, comparing the steel tank above ground with a concrete tank under ground we have the following for steel as against concrete tanks. Costs per gallon are based on a 30,000-gallon tank for the 1918 market:

	Steel	Concrete
Tank erected	.085	.09
Foundation	.005	.00
Ground space	variable	.00
Depreciation	.085	.00
Insurance increase	.04	.00
Maintenance	.03	.00
Additional heating	.045	.00
Loss from evaporation	.15	.00
Cost per 30-year gallon	.44	.09

In the above we took the life of a concrete tank at 30 years. In view of what I said in a former paragraph, it is not fair to limit its life to 30 years, but rather to a 60 or a 100-year span, in which we find the cost of a concrete tank still 9 cents, as against 88 cents and 132 cents per gallon and so on indefinitely.

No Special Foundations for Concrete Tanks

A concrete tank furnishes its own foundation, whereas a special foundation is necessary for a steel tank. In the above table I have given the ground rental as variable. In no case will this be zero, and it will often run to many dollars per square foot. Indeed, space is frequently not available at any price for a tank above ground.



Interior view of 150,000 gallon fuel oil tank built for the Steel Car Forge Co., Ellwood City, Pa.

No Increased Insurance for Concrete Tanks

Nothing need be said of the fire risk of ordinary steel tanks. This can easily be ascertained by an examination of the rates applicable where oil is so stored. We have some interesting interviews in the past few years with the largest fire underwriters in the country, the result being that we are permitted to build our concrete oil tanks wherever we please, without altering in any way the existing insurance rates. A finer indorsement could not be asked.

Concrete Saved 80 Per Cent Evaporation Loss

The question of evaporation in storage tanks, with

the consequent lowering of specific gravity, is gaining some of the attention which its importance deserves. It has been the experience of a prominent refining company, which kept accurate data, that the loss by evaporation from a 50,000-barrel crude oil storage steel tank, during a period of one month of average temperature was 15,000 gallons. This is not a loss in quantity, but a loss in the specific gravity of the whole, as it is mostly the high-grade gasoline content that escaped. Another refining company has put in an underground concrete system with a saving of 80 per cent of this loss.

Build Quickest with Concrete

It is manifestly unfair to compare time of delivery of steel tanks in 1918 with that of concrete tanks during the same period. I grant that the raw materials that go to make up a steel tank were under a greater handicap during this period than those which go into a concrete tank. During this period no steel tank company would promise deliveries under six months, whereas in every case, speaking of our own experience, tanks were delivered in from four to six weeks. A great part of this time advantage must always remain in favor of the concrete tank, whatever the state of the steel market may be.

Proper Design and Construction Essential

No doubt some that read this article may have in mind a tank, or have heard of one, that has not given satisfactory service, due principally to leakage caused by cracks, improper proportions of concrete ingredients or bad methods of construction.

Cracks in concrete tanks are entirely due to design, foundations or temperature changes, singly or in combination. Proper engineering knowledge will forever prevent cracks due to the first of these three reasons. Experience, ganied by long study of foundation questions, will eliminate the second; and stresses, due to changes of temperature, are automatically overcome by burial.

Bad methods of construction can only be overcome by good methods. These include many factors; amount of mixing water, time of mix, equipment, forms and order of construction, which can be obtained by only competent and constant supervision. One should always remember that a tank is not primarily a foundation, but a container, and as such, should be poured as nearly monolithically as possible. This should be borne in mind in the design and building of forms. There necessarily must be some "joints," but these can be protected by steel rings and should be so handled in every case.

Proof of Desirability of Concrete Tanks

Finally, the most convincing proof, to me at least, that concrete tanks are more desirable than steel tanks for the storage of oil is the fact that four of our customers, during the past year, have been manufacturers of steel tanks.

Demolishing Concrete Bridges

Reinforced concrete is difficult to break up with sledge hammers. While it can be done, much valuable time of workmen is spent on it and it is costly.

Mr. Jay G. Jackson, a professional dynamiter of Jefferson, Iowa, was recently called upon to dispose of a concrete bridge 30 feet long and 16 feet wide which had spanned a small creek. A cloud burst had undermined one of the foundations in such a way that the county commissioners considered it advisable to rebuild the entire structure.

The abutments were of concrete without reinforcing, but the three horizontal girders, measuring 2½ x 3 feet, were strongly reinforced with steel rods.

As the approach was quite close to several buildings, Mr. Jackson adopted the following method of breaking it up:

The approaches and earthen retaining walls were first removed from the face of the abutments. The earth was blasted out. Bore holes were put down about 3 feet deep and spaced about 6 feet part. A pound of dynamite was tamped into each hole. The charges were connected together by means of electric blasting cap wires and connecting wire and the charges fired with a blasting machine. These shots left the abutments wholly exposed.

The concrete walls supporting the girders were about 8 inches thick but thickened with V-shaped projections under each girder. Directly beneath each of these V-shaped projections charges of 3½ pounds of dynamite were placed in the ground and up against the retaining walls—three charges in all. These three shots were also fired simultaneously with a blasting machine. These blasts let the girders and the floor of the bridge, which rested on them, down into three feet of water.

Having the concrete under water was an advantage because water resists the action of dynamite and serves practically the same purpose as earth tamping.

Mr. Jackson next tied together five sticks of dynamite and lowered the bundle into the water against the side of the girder through a hole cut in the floor of the bridge. After the shot, it was found that one end of the girder and the floor above it had vanished as if by magic, leaving only the reinforcing steel rods.

This process was repeated several times in order to completely break up the girders and floor. Better results could have been accomplished by firing all the shots together, but this would have been dangerous because of the proximity of the buildings. As it was, there was no flying debris to cause damage.

A fast dynamite is necessary for best results in work of this kind. Mr. Jackson used 60% straight N. G. dynamite on this job.

Austin Wagon Loader

F. C. Austin Co., Inc., Railway Exchange building, Chicago, has issued Catalog No. 7, which is a very attractive and artistic booklet describing and illustrating the Austin wagon loader, one of the many successful pieces of machinery made by the company. Its greatest economy of operation is due entirely to the self-feeding device, which is not merely a so-called man saver, but actually does away with the necessity of keeping two men to feed the buckets, as required on other machines. This device consists of 2 shovel-shaped feeders, which sweep continuously through the pile to be removed, with a range of cut 6 ft. wide, carrying the material into the bucket path and automatically withdrawing in preparation for the next cut. The elevator proper is arranged for vertical movement, both for cutter adjustments and folding back for shipping clearances in traveling. The power plant consists of a 22 hp. engine of marine type. The operating machinery consists of a direct drive chain and gear transmission, giving elevator operation, and two-speed and reverse traction. The low or feeding speed is provided for use under working conditions, while the high is for traveling.

Concrete Block and Brick

The Portland Cement Association, 111 West Washington street, Chicago, are sending to interested parties a copy of their new booklet, "Concrete Block and Brick." It is written primarily to promote a better understanding among concrete products manufacturers of the principles involved in the manufacture of good concrete block and brick.

Concreting in Winter-Time

By G. W. Maker, Aberthaw Construction Company, Boston, Mass.

To be resident in New England is, perforce, to become used to wrestling with climate. It is not because of any inherent preference for winter building that the Aberthaw Company has done a great deal of it, but because, being a Boston concern, it has to accept conditions as it found them. In the procession of the years, however, our organization has collected considerable apparatus and acquired experience in utilizing it.

There are, of course, no secrets about handling concrete in winter. Today the primitive wood-burning stove-pipe, thrust into a sand pile, has given way to a mobile arrangement of steam pipes leading from a boiler to sand, stone and water supplies so as to keep them comfortably warm for combining with cement. Steam again comes into play for clearing away every vestige of ice and snow from the forms before any pouring is done.

When it is a question of protecting the freshly filled forms, the dry heat of the "salamander" is applied under a protecting drapery of canvas. This shifts the danger from frost to fire; but, of the two, the latter is preferred when temperatures slip below the zero line. The under side of new floors are kept from freezing by means of batteries of salamanders, the upper sides by layers of building paper reinforced with hay or straw, and, at times, again covered with canvass that deflects the heat that trickles from below through apertures carefully distributed in the floor.

The Aberthaw Company keeps on hand some eight acres of canvass covering for winter construction purposes, sufficient to provide picturesque outer garments for a very large building. Of salamanders it commands a small army. But none of this apparatus for preventing freezing is automatic. It has to be used with care, plus knowledge. Neither quality avails much without the other.

The Aberthaw Company has had need to exercise its full possession of both under many trying conditions; none worse, however, than those encountered in the winter of 1913-14 during the erection of a plant for the St. Lawrence Pulp and Lumber Company at Chandler in the Province of Quebec, Canada. When the thermometer dropped lower than eighteen degrees below zero, the men considered it too cold to work. Above that frigid mark, the job went merrily on, and concrete was safely and satisfactorily placed.

Another test case was the building of the Bethlehem Company's great destroyer plant at Squantum, Massachusetts throughout the fearful winter of 1917-18, when the salt river froze to a depth that defied the dredges until their way had been cleared by dynamite. Cold to the contrary notwithstanding, concrete and steel were shaped to their appointed form, and the work was completed according to schedule.

Conditions such as these, in fact any winter conditions, involve added cost in building. Human efficiency is somewhat depleted by the cold. There is expense for heat, and for the extra labor involved in covering and uncovering. But, when it comes to estimating this added cost in terms of percentages, no exactly satisfactory conclusion can be reached. Varying conditions, some of which are hardly to be forecasted, forbid an exact equation. Still it may confidently be stated that where business in sight necessitates plant expansion, the extra cost of winter building is negligible as compared with the extra cost of delay.

Analyses and Assays of Rocks

What the Geological Survey Can Do With Your Specimens

"Hello! Hello! Yes, this is the chief clerk of the Geological Survey! An analysis? Oh, an assay of some rock! No we cannot make assays or analyses of rocks, but if you will send the rock to the Director of the Geological Survey, Department of the Interior, an inspection or simple chemical test will be made and the findings reported to you."

The above is a common telephonic conversation between members of Congress or others and the officials of the Geological Survey. A considerable percentage of the Geological Survey's correspondence is of the same kind.

The question is also frequently asked "What is the difference between an assay, an analysis, and an expert examination of a specimen of rock or mineral"—such a specimen as may be sent to the Geological Survey by anyone who has found or thinks he has found a valuable mineral? Ninety-nine out of every hundred specimens submitted to the Geological Survey are found an inspection or test, however, is widely different from an analysis. A complete analysis of a rock that is composed of many different minerals may require from two to six weeks' time in the laboratory, involving the more or less continual attention of a chemist equivalent to three or four days of his time, and such work is done by the Survey only in connection with its own scientific investigations. An assay, on the other hand is usually a fire test made to determine the exact metal content of an ore specimen. The Geological Survey makes no assays for private parties.

The government has recently printed U. S. Geological Survey Bulletin 700, by W. F. Hillebrand, entitled "The Analysis of Silicate and Carbonate Rocks." This is a revision of Bulletin 305, which was so highly valued in Germany that it was translated and republished there. It contains a detailed description of the analytical methods employed in the laboratory of the United States Geological Survey and represents the experience gained in the analysis of more than a thousand igneous rocks alone. These analyses have been carried to a degree of completeness previously unknown, by methods that have been carefully tested and proved, some of them devised in the Geological Survey.

A copy of Bulletin 700 may be obtained on application to the Director of the Geological Survey, Washington, D. C.

Road Builders and Crushed Stone Producers Meet

The seventeenth annual convention of the American Road Buliders' Assocation will be held at Louisville, Ky., February 9 to 13, 1920, and the National Crushed Stone Assocation's annual meeting will be held February 10-11-12, 1920, Louisville, Ky.

In connection with this meeting of the American Road Builders' Association, which will be the Tenth American Good Roads Congress under the auspices of the A. R. B. A., there will also be held the Eleventh National Good Roads Show. At the 1918 and 1919 meetings the show feature of the congress was confined to small exhibits that could be accommodated in the hotels in which the meetings were held. The conditions which led to the adoption of this plan no longer existing, it is proposed to make the 1920 show similar to the complete exhibits that were held previous to 1918.

Cement Mill News

Although active operations at the Castalia Cement Company's plant at Castalia, Ohio, will not be started until March, a large force of men is now employed in remodeling and rebuilding the interior of the plant. Machinery is being torn down and rebuilt and some new machinery installed, designed to increase production and efficiency. A big rush of business is anticipated in the spring.

Operation of the Beaver Portland Cement Company's plant at Gold Hill, Oregon, on the Southern Pacific line, will commence the latter part of this month. Fletcher Linn, of Portland, of the reorganized company announces.

About $800,000 has been invested in the enterprise, which promises to develop into one of the important industries of Rogue River valley. The output will be 1,200 barrels of cement daily and a working force of 100 men probably will be employed.

D. L. Carpenter is president of the company; W. H. Muirhard, vice-president and treasurer; L. A. Adams, secretary, and W. H. Green, plant superintendent.

Manager R. E. Bristol of the Ogden Portland Cement Company, Salt Lake City, Utah, stated recently that he expected the new cement plant in Portneuf canyon, Idaho, would be ready by spring if the machinery manufacturers did not fail in their task. The daily output will be 1,000 to 1,200 barrels. The Idaho cement factory will represent, when completed, an investment of $1,000,000, and will serve southern Idaho and western Wyoming. Montana competition is met the other side of Dillion, and Spokane and Portland competition at Huntington, Ore., he said.

The Santa Cruz Portland Cement Co., Davenport, Cal., is now installing a 36-in. by 60-in. Fairmont crusher, a Jumbo Williams mill and a 3½-yd. shovel.

For the first time since the beginning of the war, the works of the California Portland Cement Co., Colton, Calif., are operating at full capacity. Three kilns were put into operation about two weeks ago which had been idle since the beginning of hostilities. The increased cost of fuel with which to operate the kilns forced a suspension of this work, and consequent laying-off of men. The falling-off in building, as a result of the general suspension of all non-war activities, caused a great reduction of output. But with the present building activity and the great demand for all kinds of building materials, even operating at full capacity will not supply the needs of the market. More than 300 men are now on the payrolls.

At the annual meeting of the Marquette Cement Company, held recently, directors and officers for the coming year were elected. The resignation of E. J. Dalton, as secretary-treasurer, was accepted and his successors were named.

Charles J. Hanley of the Chicago office is named treasurer, and Walter A. Wacker, also of the Chicago offices of the Marquette Cement Company, is named secretary. Both are of well-known ability and enterprise and their selection for these important posts is a recognition of their efficient services.

Mr. Hanley is a son of the late Justice P. Hanley of La Salle, Ill. He was also named a member of the board of directors. Mr. Wecker is a former resident of Peru, Ill.

The directors named for the year 1920 are: T. G. Dickenson, Robert Dickenson, N. W. Duncan, Stuart Duncan, Seller Bullard and Charles J Hanley.

The directors chose the following officers:

Chairman of the Board—N. W. Duncan.
President—T. G. Dickenson.
Vice-President.—William Dickenson.
Secretary—Walter A. Wecker.
Treasurer—Charles J. Hanley.

Extensive improvements which will greatly facilitate the output of the plant are being started at the Lehigh Portland Cement works just east of New Castle, Pa.

The present plans call for the reconstruction of three of the big kilns at the plant, which will be torn down and reset, so that the fuel used in burning the cement can be utilized in generating the steam at the plant.

One kiln was fixed up in this manner as an experiment the past summer, the gas and flame generated by the combustion of the fuel used in burning the cement being carried to the boilers, where it is used in firing the boilers instead of allowing it to escape and be wasted as heretofore.

Authority for the retrial of R. F. Butchart and Clarke Moore, president and general manager of the Oregon Portland Cement Company, indicted on charges under the anti-trust law, was received by Chief Assistant United States Attorney Barnett Goldstein, Portland, Ore. The original indictment included the officers of the Oregon Portland Cement Company, as well as the officers of eight other cement companies on the coast. Other companies pleaded guilty and paid large fines. In the recent trial of the Oregon company, the jury disagreed, and Bert E. Haney, former United States attorney, and Goldstein, who jointly conducted the trial, immediately asked authority from the attorney general for the retrial of the company. The case will be set for early trial.

A big shipment of cement for Honolulu was loaded recently by the steamship Brookdale at the Olympic Portland Cement Company's dock, Bellingham, Wash. It approximated 5,000 barrels. Honolulu is a good customer of the local company and in the past has bought thousands of barrels of its product.

Three thousand barrels of Portland cement is the daily production of the Standard Portland Cement Company's plant, Leeds, Ala., recently purchased by the Atlas Portland Cement Company of New York. Engineers are planning big enlargements. With control of this manufacturing enterprise, the new owner secures nearby deposits of limestone, sandstone and sub-carboniferous shale, sufficient for material during the next 150 years. Close by is the Cahaba Valley coal basin from which fuel can be secured for many years to come. Electricity produced by hydro-electric development is the motive power of the plant.

Cement Firm Houses Employes

To house its employes the Louisville Cement Co. is building a large number of substantial cottages at Speed, Ind., near Louisville, Ky. Six of them are nearing completion. The original plans were to build thirty houses, but the difficulty in securing lumber at this time has retarded the work. Each house will be of re-enforced concrete. In addition to the homes the company will provide a large community house where the employes and their families can have a place for recreation. The company already has several houses at what is known as the "White City," a settlement near the mills. All of the houses will be equipped with an electric light and water service.

State-owned cement plants do not make much of a hit with the Oregon house of representatives, which fact was made apparent to Representative Scheubel, when his bill, House Bill 46, authorizing the state highway commission to own and operate paving plants, came up for final consideration in the house Thursday afternoon.

The consideration of the measure precipitated the one fight of the day, finally resulting in the failure of the bill to pass by a vote of 26 for it, the same number of votes against it and 7 absent. It requires 31 votes to pass a measure through the house.

Smith of Baker led the onslaught upon the Scheubel proposal when the bill came up for final consideration. He contended that it would cost $3,000,000 to equip a cement plant ready to operate on a scale sufficient to meet the needs of the commission. He said that it was unwise and a foolish experiment. He also argued with great emphasis that he was compelled, in addition to all the other objections, to vote against it because it was not emergency legislation and, therefore, had no place in the special session.

Dennis, chairman of the roads and highways committee, which had given the measure a favorable report, championed it, contending that to give the commission the power to purchase and operate such a plant would result in cheaper materials for the state highway construction work, whether the power were to be used or not.

John Cawley, an employe of the La Salle Portland Cement Company, La Salle, Ill., had a narrow escape from fatal injuries when he was caught between a moving freight car and a cement chute while at work. It was at first believed that Cawleys condition was critical, but after he had been removed to St. Mary's hospital physicians said that he would probably recover.

The management of the Peninsular Portland Cement Company of Cement City, Mich., and other industries of that state are making demands on the unemployed of nearby cities in Northern Indiana and last week a representative of the cement company took eleven men from Fort Wayne to Michigan, where they will take employment in the producing of cement.

The demand for common laborers still increases and as the wages for this line of work go up there seems to be a greater demand for men and less men to fill the jobs. The average man has today a hobby which he calls a trade and it is almost impossible to persuade him to lay it aside for a few months and accept employment that offers more than his line of work offers.

Word has just been received from the headquarters of the Lehigh Portland Cement Company to start Mill 1, at Mitchell, Ind., and all hands are now getting this mill ready to start. This mill has not been in operation for the past six years. It was closed down years ago because Mill 2 was able to fill all the demands for cement, but now the demand for the product has so increased that it will be necessary to operate both mills at full capacity.

Mill 2, which was closed on account of the coal strike, will start just as soon as sufficient coal can be had and shipments are already on the way. It will be some time in February before Mill 1 can be started. It is no small job to close and start one of these immense plants. When the two mills are in full operation the total output of cement will be 6,000 barrels per day.

Owing to the fact that the demand for cement is unusually good, and also that the storage rooms are all empty at present, there is every assurance that a big, long and continuous run is before these two Lehigh plants and that the big pay roll will turn loose a lot of money in Mitchell. Making an unofficial guess it might be said something like $50,000 every two weeks.

Atlas Cement Company Buy Alabama Cement Plant

The Atlas Cement Company, the second largest concern of the kind in the United States, according to reports in industrial circles, has acquired control of the Standard Portland Cement Company plant at Leeds, Alabama, and will make extensive developments there, practically doubling the works in the course of a short time.

Property adjacent to the plant has been bought in and Trenton limestone, subcarboniferous shale and sandstone, three of the essential products needed for the manufacture of cement, to suffice for a couple of hundred years, are obtained.

In addition, close contact to the Cahaba valley coal basin will assure fuel for many years, in fact a mine but a short distance removed is now supplying the industry with what fuel is needed, hydro-electricity being motive power employed at the plant.

The same management as now obtains at Leeds will be continued, even down to the office boy. Property has been purchased on which houses will be erected for employees, the intentions being to increase the number of operatives materially during the coming year, the output of the plant to be developed.

More than $1,250,000 is involved in the transaction. As stated, there will be no change in the management of the plant, so far as its operating forces are concerned.

The cement plant was located at Leeds fourteen years ago and additions have been made from time to time until the capacity is around 3,000 barrels of the product daily. The cement produced there is said to be among the best in the world and a market has been worked up that promises steady operation indefinitely. The limestone, shale and sandstone found in the immediate vicinity of the big works are considered among the best to be found in the entire country, and the development proposed will not exceed the possible supplies of the various products needed.

The deal is one of the largest consummated in this section in some time and future possibilities of the plant are not to be estimated.

Mammoth Cement Plant for Phelps, N. Y.

Interest in the establishment of a mammoth cement plant in Phelps, N. Y., a project under consideration, but dropped at the outbreak of the war, has been revived with the announcement that the officers of the Dealers' Cement Corporation, the firm promoting the industry, are interested in another big enterprise—the deepening of the potash beds recently discovered on a 22,000-acre tract in Tioga County, Pa. Control of the coal fields prior to the discovery of the potash, said to be valued at several million dollars, has been acquired by the Dealers' Cement Corporation, of which Walter J. Bennett, of Syracuse, N. Y., is president, for the purpose of supplying the proposed cement plant with fuel. What effect the new turn of events will have on the cement plant matter is not yet known, but it is predicted that the cement plans will go through even larger than at first contemplated.

Southwestern Portland Cement Co.
Victorville, California

The application of electric drive in the operation of a cement mill and the advantages to be derived therefrom are unusually well exemplified in the plant of the Southwestern Portland Cement Company at Victorville, Cal.

The town of Victorville is in the southwestern part of California, about one hundred miles from Los Angeles, on the Santa Fe railroad, the track of which pass by the plant, affording a convenient outlet for the finished product.

The mill has an output of 300,000 bbls. a year of Portland cement, and employs approximately 80 people All of the buildings are of substantial concrete construction, built to withstand the severe conditions imposed by the heavy cement mill machinery installed.

The system of manufacture used is known as the "wet process," and water for use throughout the mill is raised to a reservoir on a hill back of the plant by a 15-hp. motor-driven triplex pump.

Rock and shale are brought to the mill from the quarry, which is located 7 miles distant, by steam locomotive hauling trains of cars which have two compartments or hoppers, one of which is dumped at a time to the crusher.

Fig. 1.—The 250 hp. Westinghouse motor driving Williams mill

Electric current is purchased from the Southern Sierras Power Company, thus relieving the company of the expense and trouble incident to the operation of a power plant. Current is received at 33,000 volts and stepped down to 440 volts, for application to the various motors installed throughout the mill.

The transformers and switching apparatus are of the outdoor type, located immediately adjacent to the mill. The current is taken from here to a 7-panel marble switchboard built by the Westinghouse Electric & Manufacturing Co., from which it is distributed to the various power and lighting circuits in the mill.

The lime rock is delivered from the hopper cars direct to the crusher, but a reserve pile of crushed stone, amounting to between 3,000 and 5,000 tons, is maintained sufficient to keep the mill operating for a period of approximately thirty days. This reserve is maintained in the event of an accident, such as a washout, crippling the railroad service from the quarry to the mill.

The crusher and Williams mill are driven by a 250-hp. Westinghouse type "CW" wound-rotor motor, as shown in Fig. 1, which break the rock into pieces about the size of a walnut or a little larger. From here the rock is elevated to a storage bin by a bucket elevator, driven by a 30-hp. motor, and thence by belt conveyor to the pulverizing house. Up to this time no water has been put with the rock except

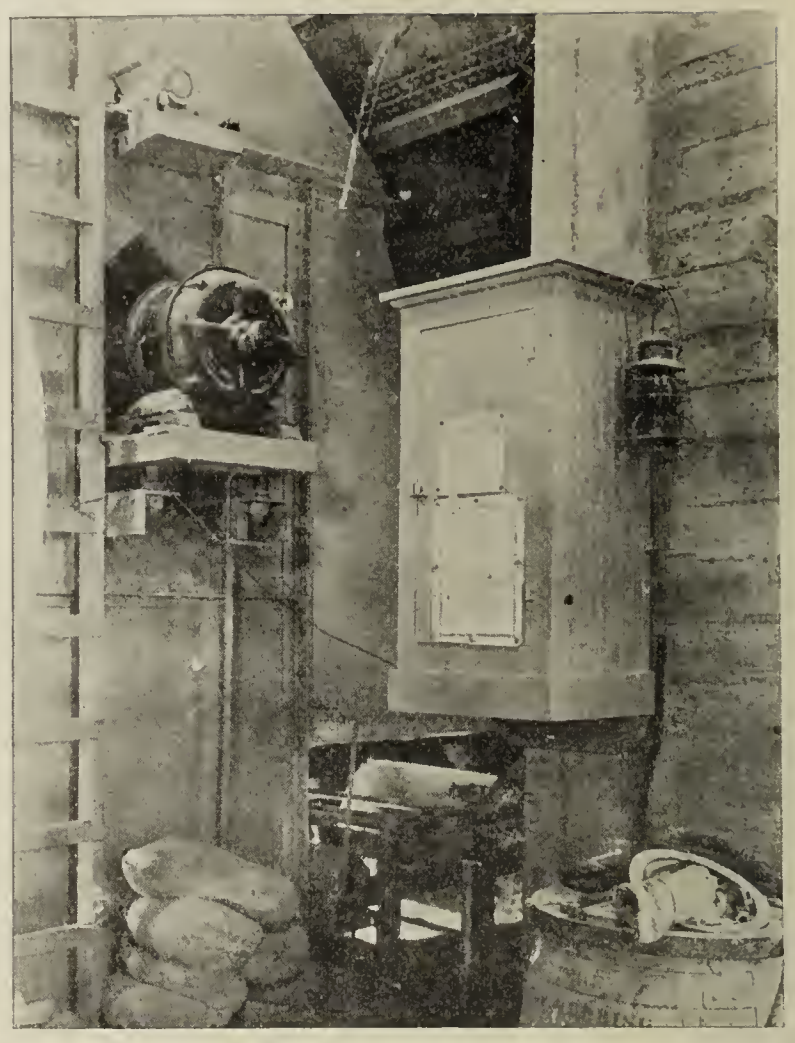


Fig. 2.—7½ hp. Westinghouse motor driving clinker elevator

what is thrown on at the time it goes into the crusher, which is done with a hose to eliminate whatever dust rises at that time.

During the process of pulverization water is added, eliminating the dust. After being thoroughly pulverized, the mixture is taken to the slurry tanks, where it is kept in motion by air agitation until ready for admission to the kiln.

There are six slurry tanks served in pairs by elevators operating at a speed of approximately 88 ft. per minute, for elevating the mixture from the pulverizing house tanks, and driven by a 7½-hp. constant speed motor.

After the mixture has been thoroughly agitated it is transfererd to the slurry tanks nearest the kiln. From here it flows into a sump and is delivered to the kiln by a motor-operated measuring device illustrated in Fig. 4, which shows the rear of the scale. The dipper is made in the shape of an "S," the outlet being in the center. By raising and lowering the dipper in the sump the amount of slurry entering the kiln

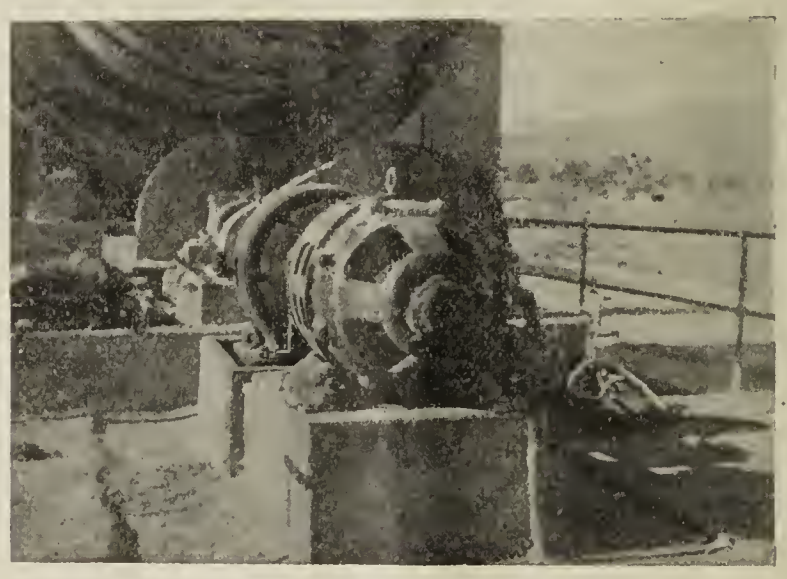


Fig. 3.—The 50 hp. Westinghouse motor driving Vulcan kiln through Foote 14 to 1 reducer

can be controlled. The dipper is driven by an extended shaft, provided with two universal joints, from one of the elevators and is raised and lowered by a ¼-hp. 1,725-r.p.m. motor by means of remote control from the klinker end of the kiln. The large scale is visible to the operator at the klinker end and he can feed the proper amount of mixture to the kiln and watch his fire at the same time.

The Vulcan rotary kiln is approximately 200 ft. long and 20 ft. in diameter, lined with fire brick and heated by an oil burner to a temperature of about 2,500 deg., which is measured by a radiation pyrometer. It is driven at a speed of one revolution per minute by a 50-hp. type "CW" 700-r.p.m. motor through Foote reduction gears, as shown in Fig. 3. The kiln is elevated at the raw end so that as it rotates the mixture will travel toward the klinker end. Upon coming from the kiln the klinker falls about 20 ft. into a pit to allow it to cool somewhat. It is then elevated by the klinker elevator, which is driven by the 7½-hp., 680-r.p.m. motor shown in Fig 2, to an automatic scale and dumped into the storage bin. From the

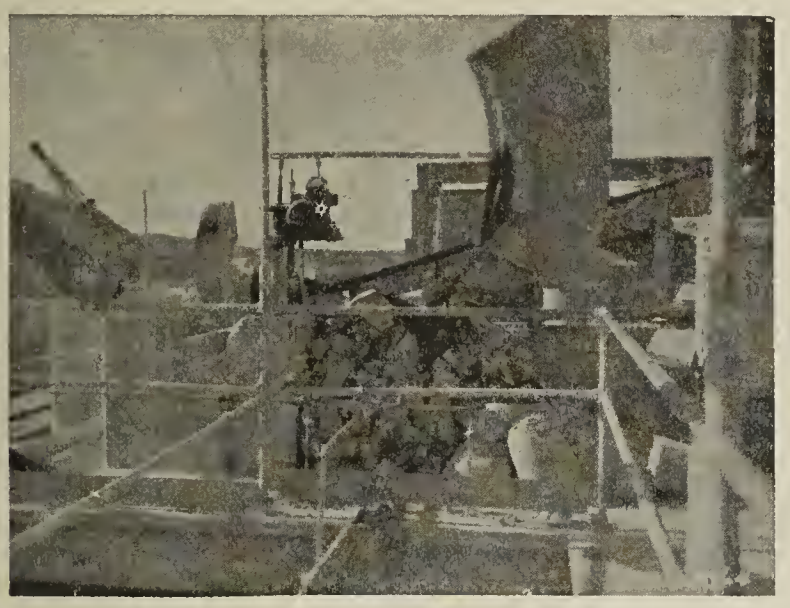


Fig. 4.—¼ hp. Westinghouse motor driving kiln slurry feed control dipper

klinker storage it is transferred by means of a locomotive crane with a clamshell bucket to a bin, from which it is fed into the finish mill. The locomotive crane is also used for mixing the klinker, as it will vary somewhat in quality. After being ground and analyzed by the chemical department, it is ready for the packing house, to which it is carried on a belt conveyor over a weighing machine, which automatically records the number of barrels that pass.

From the storage bins the cement is taken to the sacking machines, driven by a 15-hp. motor. A sack cleaner driven by a 7½-hp., 680-r.p.m. motor through a Foote reduction gear is used; a 15-hp. motor-driven blower for collecting dust from the sacking and sack-cleaning machines is also used.

The motors are of the alternating current, 440-volt, 60-cycle, three-phase and were furnished by the Westinghouse Electric & Manufacturing Co. of East Pittsburgh, Pa.

This plant was designed and built by Mr. L. D. Gilbert and has been in operation over three years, during which time no shutdowns have been experienced due to any trouble with the electrical equipment furnished by the Westinghouse Company. It is a model plant from every standpoint and is practically dustless.

Thirty-seven Years, Life of Gates Crusher

H. A. Martens, vice-president of the Mayville White Lime Works, Mayville, Wis., reports to the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., that a gyratory crusher at his company's Richmond quarry, a No. 5-B, sold in 1882, is still doing business, and "judging from its condition at the present time it ought to be crushing stone for a good many years yet." Apparently this crusher was operated all but eight years of its life, and after eight years' rest required only rebabbitting to start all over again.

Dodge Friction Clutch

The Dodge Manufacturing Company, Mishawaka, Ind., probably owes as much of its reputation to the Dodge friction clutch or cut-off coupling as to any other item in its comprehensive line of power transmision machinery. The Dodge clutches, of both solid and split types, have been on the market for a long time and more than 50,000 are in operation. They are made for all kinds of service and each clutch is a separate and distinct mechanism, not in any way a part of the pulley, sheave, gear or sprocket which may be mounted on its sleeve. This fact is important because it enables the user to change the speed of a machine, when necessary to increase efficiency, simply by substituting for the pulley in use another of proper diameter. The clutches respond readily to the mill of the operator and adjustments are simple and quickly made. Their friction members are high in pulling power and durability and may be renewed, if necessary, with little trouble and at low cost. In almost every plant there is at least one machine unnecessary to operate all the time. If such a machine can be thrown out of service when not needed, the power required to run it is saved. Not only can certain machines be stopped advantageously a part of the time, but in many instances the use of a whole section or floor or a factory can be dispensed with. The Dodge clutch makes it possible for a manufacturer to avail himself of every economy of this kind. Daily savings may be slight, but in the course of a year the savings probably will amount to more than the expense of installation. Another feature of the clutch that commands attention is that it reduces accidents, effecting savings in workmen's compensation thereby which are inestimable. Again, the clutch may save large costs from stoppage of machinery because it enables the operator to throw one machine or more out of service immediately upon the detection of a slight disorder.

New Orders for Traylor Crushers

Traylor Engineering & Mfg. Co., with general offices and works at Allentown, Pa., among recent orders for crushing equipment with which it has been favored are the folowing: One complete crushing plant for El Paso & Southwestern Railway Co., consisting of one 16-in. Traylor "Bulldog" gyratory crusher; one 14-in. Traylor "Bulldog" gyratory crusher; one 48-in. by 14-ft. Traylor heavy-duty revolving screen; one No. 8 stone elevator and all necessary transmission power equipment. For Charles Warner Co., Philadelphia, one complete crushing plant, consisting of one 5 by 14-ft. Eccentric Grizzly feeder; one 48 by 60-in. Traylor "Bulldog" jaw crusher; one 60-in by 18-ft. heavy-duty revolving screen, as well as other incidental crushing plant equipment. For National Slag Co., one set 36 by 16-in. Traylor heavy-duty crushing rolls with corrugated shells. For Birdsboro Stone Co., four 10 by 72-in. "Bulldog" jaw crushers for recrushing the oversize from its large initial jaw crusher. These crushers have all of the special features of the "Bulldog," including steel band reinforced frames, self-aligning toggle system, etc. The Birdsboro Stone Co.'s installation is undoubtedly an interesting one, as

the Birdsboro people are convniced that these crushers will be more economical to operate than the crushers now installed. The plant for the El Paso & Southwestern Railway Co. is for producing ballast, while the Charles Warner Co.'s plant is a limestone crushing plant.

Keeping Accurate Accounts Is One Way to Make Money

Knowledge of Fundamentals of Business Is Important Factor—Uniform System for Contractors Advocated

The theory that any accountant can step in, take charge of your books for a short while and then tell you more about your own business than you know yourself, does not sound reasonable to Tom P. McGrath, of the McGrath Sand and Gravel Co., of Lincoln, Ill. He argues that an accountant ought to specialize in one particular business in order to be thoroughly efficient in that business, because a careful study of the peculiar conditions surrounding the business is a matter of necessity.

Just to show that he practices what he preaches, Mr. McGrath gives a number of accounting hints for a sand and gravel business. Here they are:

Liability Insurance.—Present statement to your insurance agent of losses sustained during the years of operation, and if losses are low and the rate is high, keep on the subject until after an experience rating is given.

Fire Insurance.—The same thing applies here. If all the operators have this matter up, we will have more success in getting a reduction in rates.

New Accounting.—Immediately upon the opening of a new account, get a rating and preserve it.

Collections.—Use a good follow-up system. Be able to write a good letter and not one of the rubber stamp kind. A good letter is short and direct, diplomatic and at the same time, convincing.

Bookkeeping.—Trial balance system, statements of assets and liabilities, and trading profit and loss, as often as necessary to keep in touch with the condition of the company, at least once a month.

Operating.—Watch the daily tonnage report. If not up to the standard, notify the manager of operations, and then it is up to him to correct the fault.

Banking.—Watch your bank account and never overdraw. It is a bad habit and destroys credit.

Stripping.—The cost of stripping or overburden, should be placed in Miscellaneous Assets, and monthly charges made against this account in accordance with the amount of stripped surface consumed.

Bad Accounts.—When every means to collect an account has failed, charge it off. Then if later on the account is collected, apply it to the earnings of the current year.

Taxes.—The accountant should familiarize himself with the normal income, excess and war profit tax exemptions, allowances and deductions as they affect his own line of business.

Depreciation.—The rate of depreciation should be arrived at in the same way as an experience insurance rate is figured, namely, if the average life of your plants in the past has been 10 years, the depreciation should be charged at 10% of the original cost. A replacement reserve account should be opened and credited with the amount charged to depreciation. If the replacement reserve becomes equal to the original cost of the plant no further charge.

Obsolescence.—In case the plant becomes obsolete before the replacement reserve has become equal to the original cost of the plant, the difference between the replacement reserve and the original cost, minus the salvage value, should be charged to obsolescence.

If you are operating a plant whose normal life is 10 years, on property on which you have a lease for only 5 years, without privilege of extension, then a yearly charge of 10 per cent for depreciation and an additional 10 per cent for obsolescence, making a 20 per cent charge against the original cost, should be made.

Repairs and Supplies.—When repairs and supplies are bought to maintain the plant in operation, they should be charged against expense, and not entered under assets which would show an increased valuation of your plant.

Depletion.—The depletion charge allowed by the Government in computing taxes, is based upon the cost of the gravel property, plus the cost of that part of the property that the plant, equipment and switch tracks occupy, from under which the sand and gravel cannot be excavated.

L. A. Weatherwax, of Henrickson & Co., Inc., contractors, of Seattle, Wash., makes a plea for standardization of accounting methods among contractors. He begins his argument by recalling the all too familiar situation at the opening of bids for almost any piece of construction work. Almost without exception, the bids are so varied because of the different methods of accounting used by the bidders, that those in charge of awarding the work are inclined to grow suspicious of each and every bidder, and of contractors as a class.

It ought not to be hard to devise a uniform system, because the great majority of contractors are operating on an invested capital of not more than $100,000. Furthermore, unless the contractors devise such a system themselves, the Government probably will step in and do it for them.

The periodical collections for state industrial insurance, medical aid funds, etc., make it necessary that the contractor should know just where he stands. The frequent inquiries from Dun and Bradstreet for credit data, and last but not least, the things that the banks want to know and have a right to know when the contractor goes to them to borrow money, all emphasize the necessity for a uniform system of accounting. It is bound to come some time, and the contractor undoubtedly could hasten its coming if he would start the ball rolling without delay.

Huge Order of Elevator Belting

One order of belting, containing 44,254 feet—about 8½ miles—was recently shipped by the B. F. Goodrich Rubber Co., Akron, O., for the Pennsylvania Railroad's new grain elevator at Canton, Baltimore, Md. This shipment, valued at more than $125,000, weighed 131 tons, and seven box cars were required to transport it. The belting is of two types, viz., elevator and conveyor, the elevator belts being 32 and 38 inches wide, respectively, and the conveyor belts 36, 42 and 48 inches wide, respectively. The capacity of one of the 48-inch horizontal carrier belts is 350,000 bushels of grain per day of 10 hours. The elevator, built for the railroad company by James Stewart & Co., Chicago, will load vessels with grain for both export and coastwise shipments. The complete belting equipment will enable the plant to handle about 2,000,000 of bushels of grain every day.

New Catalog

The American Cement Machine Co., Inc., Keokuk, Iowa, are sending out catalog No. 920, 8½x11 in., 63 pages, illustrated, describing "'Boss' Labor-Saving Construction Machinery." It contains descriptions of various forms of contractors' concrete machinery and equipment, with illustration of their use.

An Up-to-Date Quarry and Crushing Plant

To develop a dome of basalt located on the west side of the Frio river just south of the main line of the Southern Pacific railway in Uvalde county, Texas, the Texas Trap Rock Co. built a very interesting and complete heavy duty crushing plant and opened up an extensive quarry.

The rock is a nephelite basalt closely resembling the trap rock of Maryland and New Jersey. It has a crushing strength of over 30,000 pounds per square inch, is very tough, crushes in cubical form and makes an excellent material for the wearing surface of country highways or city pavements, as well as being one of the best possible coarse aggregates for a real fireproof concrete.

Quarry

The quarry is on the northeast side of the hill. The working face is from 50 to 80 ft. high and the basaltic columns stand on end with a slight inclination from the vertical.

sprung and loaded with dynamite. Blasting breaks the basaltic columns and the shock of the explosion traveling upward along cleavage planes causes them to fall forward. Occasional large masses are block-holed and reduced to handling size by use of jack hammer drills.

Quarry to Crusher

The rock is loaded by hand into low underslung steel cars of three tons capacity, especially designed for hand loading. These cars are taken across the Frio river on a bridge and hauled up an incline 900′ long with a 6 per cent grade to the crusher dump. This incline is operated by a steam hoist which hauls up the loads. The empties return to the quarry by gravity, overhauling the cable.

Crushing Plant

At the crusher dump the end gate of rock car is automatically released and rock falls into No. 8 Gates breaker. The output from this primary crushing

Trap Rock Quarry in Texas, showing Sullivan drills

Erosion by the river had produced a cliff resembling the Palisades of the Hudson on a smaller scale, and very favorable as a quarry location. Because of railroad facilities, and occasional floods of the Frio it was necessary to locate the crushing plant on the other bank of the stream at an elevation 25′ above the quarry floor. Quarrying is accomplished by drilling horizontal toe holes 20′ long and about 10′ apart. Sullivan 3⅝″ Hy-speed air drills are used and holes are

passes over a steel grizzly which separates all rock under three inches from the oversize. The oversize rock goes into a No. 5 Gates and a No. 5 breaker, which gives it the proper reduction. Rock passing grizzly and No. 5 breakers goes into a large elevator which takes it to the screen house. Here it passes through a circular revolving screen which separates it into commercial sizes and it is then stored in bins under the screen-house and over railway tracks. On account

of a demand for rock one-half inch and under, a crushing roll was installed which is fed with 1¼" rock from screen-house when an extra quantity of small sized trap rock is wanted. On account of the hardness of rock, mantles and concaves of breakers are of manganese steel. The same material is used for crushing roll shells and chute linings.

Power Plant

Power is furnished by two 125 h. p. boilers burning Mexican crude oil which supply steam to a 20"x42" Corliss engine and a W. B. 2 Sullivan air compressor with capacity of 550′ of air per minute.

As the plant is located in a section where all surface streams are dry except during floods it was necessary to drill for water. Wells with a plentiful supply of water are extremely hard to get in the vicinity, and an exhaustive geological study was required to determine proper location of well. This was successfully done, and an abundance of excellent water is available, standing at a level 200′ below the surface of ground, the well being 946′ deep. A 6 h. p. gasoline engine runs a generator for lights and simultaneously pumps water sufficient for the day's run of plant, thus killing two birds with one stone.

Personnel

The Texas Trap Rock Co. has its principal office in San Antonio, Tex. R. W. Prosser is president, Adolph Wagner, vice president, and A. H. Muir, treasurer and general manager. E. L. Dennis, Jr., is sales manager.

Market

The company has sold its trap rock in a number of cities in Texas, Oklahoma and Louisiana; and over 1,000,000 square yards of pavements and roads have been built of this rock because of its extreme endurance against wear. It has also gone into a number of the better class of concrete buildings, and has been used extensively by the Southern Pacific railroad for ballasting its main line in Texas.

Safety Enclosing Cover for Motor Controlling Rheostats

As a result of almost continual widespread "Safety-First" campaigns, the necessity for safeguarding all machinery and those who operate it is now generally recognized throughout the realm of industry as a matter of vast importance. In the electrical field rapid progress has been made in the past few years in designing new lines of apparatus, redesigning old ones to make the safety feature more prominent, and particular attention has been paid to motor control device because, as a rule, this class of apparatus is handled either by unskilled labor or by those not familiar with electrical machinery, and the necessity for a fool-proof installation is the more obvious.

It is interesting to note how the face-plate rheostats manufactured by the Westinghouse Electric and Manufacturing Company, shown in Fig. 1, are protected and how the enclosing covers are so designed that they can readily be applied to old rheostats to make old installations strictly modern.

As shown in the accompanying illustrations, the enclosing cover is a solid sheet-steel box which fits tightly against the rheostat base and is secured by four corner bolts. Pivoted to the cover are two cast-iron arms, one with the operating handle on the outside, and one within made with a fork to engage the rheostat handle. To apply a safety cover to an old rheostat it is only necessary to remove the four nuts on the corner studs of the face-plate and replace them with adapter nuts and studs, furnished with the cover. The rheostat handle is also removed and a fiber tube substituted. The cover is then put on so that the fork on the inner arm engages the insulating tube and the four nuts that were on the original rheostat are used to fasten the cover in place. The lead wires from the rheostat are brought through insulating bushings that are held in place by the edge of the cover. While no packing is used to make the cover water-tight, it fits so closely that it effectually prevents the entrance of metal chips, sawdust, or other material that could cause injury to the rheostat. The cover is grounded through the corner bolts and, being insulated from live parts, renders it fool-proof and makes it impossible for an operator to accidentally receive a shock through coming in contact with the working parts of the face-plate.

Westinghouse Rheostat ready to attach cover, showing adapters replacing nuts and fibre tube replacing handle.

Westinghouse Rheostat with face plate cover attached

The use of these covers or similar devices is one of the important requirements of the modern factory or machine shop, and in some localities it is demanded by law. These covers fulfill all requirements of a safety-first device and are easily and readily installed.

New Publication

Portable Belt Conveyors for handling material horizontally or at a slight incline are described and illustrated in a new folder entitled "Type B Portable Belt Conveyors." This folder, just published by the Portable Machinery Co., of Passaic, N. J., contains prices of these machines which are made with 16-inch wide belt and in standard stock sizes as follows: 12 ft. 6 in.; 19 ft. 6 in.; 23 ft.; 26 ft. 6 in.; 30 ft.; 33 ft. 6 in. and 37 ft.

These machines in addition to being used for handling coal, sand, crushed stone, fertilizer, etc., are being used for conveying many manufactured products, bagged material such as cement, etc.

Used in series or in conjunction with fixed conveying systems, they afford a flexible, convenient and automatic conveying arrangement.

Chicago Office Opened

The John F. Byers Machine Co. of Ravenna, O., announce the opening of their new Chicago district office at 20 W. Jackson Blvd. under the charge of E. L. Kelzer. This office will render mechanical as well as sales service to the company's growing list of users of the Byers auto cranes and hoisting engines.

Reinforced Concrete Reservoirs for Fuel Oil

By H. B. Andrews

Owing to the scarcity of coal during the late war, the U. S. Government has been urging manufacturers and other large consumers of fuel to use fuel oil instead of coal, and to install containers for the fuel oil with sufficient capacity to carry them over delays in transportation or delivery. Two materials only seem to be adapted for this purpose; steel and reinforced concrete. For structures entirely above ground, steel is preferable, disregarding comparative cost. For structures below or partly below ground reinforced concrete is preferable.

Due to the previous scarcity of steel plates for any other than direct war purposes, and the attendant high prices, it has been difficult and expensive to obtain steel for any description of tanks.

Reinforced concrete has been found satisfactory for fuel oil containers if intelligently used.

Reservoirs of this material must be designed correctly, the concrete proportioned correctly, mixed and placed correctly in order to get satisfactory results, and by satisfactory results is meant that there shall be no leakage or seepage when built, or thereafter.

When these necessities have been provided for, reinforced concrete reservoirs will contain fuel oil of a consistency up to approximately 40° Baume. For the lighter oils, including kerosene, gasoline or benzine, some provision must be made for lining the tanks with special material, provided such satisfactory material is found.

In the absence of any extended experiments or definite data on the latter subject we are making no recommendation.

During the last year the writer has designed and superintended the construction of many fuel oil reservoirs of various capacities, and has some definite ideas to advance on the subject.

Specifications

First. The reservoir should be circular in shape, the better and more directly to take care of involved stresses, and to avert danger of tensile or temperature cracks.

Second. It should be so proportioned and designed as to limit the number of pouring operations of concrete, so as to avoid joints betwen these operations.

Third. Care should be taken to provide for taking care of all outside stresses, such as, upward pressure of water, earth pressure on walls, and roof, if reservoir is buried; and also to avoid concentrated loads, as on columns or walls. When joints are absolutely necessary, to so protect these joints, that there will be no leakage through them.

Fourth. To so design the piping and vents to comply with city or town regulations and insurance companies' requirements.

Fifth. To protect the concrete so that oil will not come in contact with it if less than six weeks old.

Sixth. To so design the false work for holding concrete temporarily in place that it will not fail or be distorted while placing concrete.

Seventh. To so design the concrete that it will be oilproof, and of such consistency that it will flow readily around the reinforcement without surplus water.

Eighth. To so design the reinforcement that it will take care of all interior and exterior stresses, and with fittings to hold it rigidly in place while concrete is poured.

To carry out these ideas requires competent engineers to make the design and specifications and to superintendent construction. It also requires the best materials and workmanship.

The concrete should be no leaner than a mix composed of one part of cement, one and one-half parts sand and three parts broke nstone or gravel. To this mix should be added a "Densifier." Hydrated lime has been found economical and satisfactory for this purpose, using 10 pounds dry lime to each bag of cement. The stone must be hard and clean—trap rock, granite or gravel being the best materials. The sand must be free from any deleterious matter and should be well graded. Cement must be of a good brand.

The concrete should be deposited continuously in concentric layers not over 12 in. deep in any one place.

No break in time of over 30 minutes is permissible in depositing concrete during any one operation, and if any delay occurs amounting to 30 minutes or less, the previous surface must be thoroughly chopped up with spades before the next layer of concrete is deposited.

The different operations in pouring are:

1. The pouring of floor and footings.
2. The pouring of entire wall.
3. The pouring of roof.

An approved joint or dam must be made between the floor and the wall.

When the materials are obtained they should be mixed by a mixing plant of sufficient size and power to carry out each separate prearranged operation without danger of delay during the process.

The materials should be mixed at least two minutes in the mixer, using just enough water to obtain a plastic mix without excess water coming to the surface after concrete is deposited, and a measuring tank should be used so that the amount of water may be kept uniform.

The concrete when deposited in forms should be well spaded by at least four competent laborers who are not afraid to use their muscle in compacting the concrete thoroughly and working out the trapped air bubbles.

Reinforcement sould be of round deformed bars conforming to manufacturers' Standard Specifications for "Medium" steel.

These bars should be bent or curved true to templates, carefully placed in their predesigned location and rigidly maintained there by mechanical means.

No lap should be less than 40 diameters, and no two laps of adjacent rods should be directly opposite each other.

The forms should be of good material, strongly made and braced, or held in place by circumferential bands, so that no distortion, allowing displacement of concrete during its initial set, is possible.

The surface of the floor should be trowelled smooth as soon as it can be properly done. If all previously named precautions are taken, there should be no defects in the wall to correct.

Concrete designed and placed as recommended herein is practically oil-tight, but as oils are somewhat detrimental to fresh concrete, it is advisable to put on an interior wash or coating to protect the fresh concrete from the action of the oil for such a time as may be necessary for it to sufficiently cure and harden.

Silicate of soda, while not a permanent coating, has been used satisfactorily for this purpose according to this specification for oilproofing. The surface of the floor and the interior surface of the wall are to be coated with silicate of soda of a consistency of 4° Baume, applied as follows:

First coat, one part of silicate of soda and three parts water, applied with brush and all excess liquid wiped off with cloth before drying.

Second coat, one part silicate of soda and two parts water applied the same as above.

Third coat, one part silicate of soda and one part of water, applied with brush and allowed to dry.

Fourth coat applied same as third.

A group of three circular reservoirs, built at Waterbury, Conn., according to plans and under supervision of the writer, each containing 200,000 gallons of mixed fuel oil, ranging in density from 23° to 37° Baume, which after two months' usage, filled to their maximum capacity, show no signs of leakage whatsoever.

Demolishing a Cement Bridge

By M. C. Potter

There was a cement bridge in this country that the road commissioners desired to demolish. As they wanted it down in a hurry, I was employed to blast it, proceeding as follows:

With an ordinary stone drill, I drilled ten holes 3½ feet apart and extending about two-thirds through the end walls or abutments. These walls were about 3 feet thick.

Into each hole, I packed a pound of straight N. G. sixty percent dynamite. An electric blasting cap was imbedded in each charge. The holes were well tamped with moist clay. The holes were placed just about the water level.

Holes were dug in the earth located at each of the four corners of the abutments, in each of which were loaded five pounds of the same grade of dynamite. These charges were packed compactly up against the wall at its most vulnerable point. These charges were also well tamped in with clay.

Another five-pound charge was placed down under the center of the two abutments about half way between the corner charges.

The floor of the bridge was of reinforced concrete. Four charges were placed at intervals on top of the floor. These were covered with thick mudcaps packed as compactly as possible over the dynamite. Directly under the charges on top of the floor were placed three five-pound charges underneath. These charges were held in place with clay mudcaps.

This made twenty-three charges in all which were distributed around at different points. By means of the blasting cap wires and some copper connecting wire, all twenty-three charges were connected up in series and attached to a 250-ft. leading wire running to my blasting machine which was so located as to afford me proper protection when the blast was set off.

In all 85 pounds of dynamite and 23 electric blasting caps were used. The blast caused the bridge to vanish like a soap bubble. The entire cost of the work including labor was $29.50.

Limestone for the Farm

In discussing the value of limestone as an aid in agriculture, Professor Dickey says that when a ton of pure shells (calcium and magnesium carbonate) is burned, about 1,100 pounds of actual lime, calcium and magnesium oxide is left. When this is slaked or "hydrated," it takes up water until it weighs about 1,350 pounds. When it becomes air-slaked it goes back to the original carbonate form. All lime quickly reverts to carbonate in the soil, so that the kind applied is important, chiefly as regards physical condition and concentration.

It makes little difference in which form the lime is applied, but ground limestone or shells have only about three-fifths the strength of burned lime and two-thirds the strength of hydrated lime. Fineness in lime is desirable, but it is not necessary that it be very fine. Limestone that will not pass a 50-mesh screen requires some time to become entirely available.

The value of any form of lime depends on the total percentage of calcium and magnesium oxide (total oxide) contained. In buying lime it is as important to have the analysis with each shipment as in fertilizer. Ground limestone or oyster shell contains about 50 per cent total oxide. Hydrated lime should contain 70 to 80 per cent, and lump lime or ground burned lime about 90 per cent, if unadulterated with core, ashes or slaked material.

By-product limes, so-called "agricultural limes," and lime fertilizers, such as wood ashes, should be purchased strictly on an analysis basis.

New Publications

Concrete-Steel Construction. By H. T. Eddy and C. A. P. Turner. 477 pp.; illus. C. A. P. Turner Co., Minneapolis.

A treatise on the elementary principles of design and the execution of reinforced concrete in buildings. This is the second edition of this volume, and it is rewritten to embody the most advanced theoretical developments. An attempt is made to harmonize in many cases the correct theory and the scientific practice to make for better and cheaper reinforced concrete construction. Previously used inconsistent theories and misconceptions are brought to the attention of the reader, and more approved theories substituted. The text is enlarged throughout by tests on units and in buildings to show the soundness of many formulas and how they work in practice.

A Practical Blue-Print Protector

Blue-prints are always getting dirty, wet, greasy or torn while being handled by workmen using them.

An inventive genius has designed a very practical blue-print protector of simple construction and low cost.

A sheet of transparent sheeting—the same material used for lights in auto curtains—is cut to desired size. A piece of lightweight leather substitute is then cut about a half inch larger all around than the piece of sheeting. This extra half inch allows for a lap-over on all but the top side of the protector. A sewing machine stitches the lap down to the sheeting, forming a large flat pocket, open at the top for the insertion of the blue-prints.

Both the transparent front and the coated fabric back are waterproof and greaseproof. Dirt or grease may easily be wiped or washed off either, without injury to the material. Both materials are flexible and the holder may be rolled up if desired in the same way an unprotected blue-print is usually handled by a workman.

Brass Screw Holes

As a means of avoiding the necessity for plugging up old screw holes in wood work and other material when the screws work loose and no longer hold, necessitating putting the screw in a new place, Stine screw holes, manufactured by the Stine Screw Holes Co., Waterbury, Conn., are on the market, ready-made to fit any stock screw of wood or machine type, to install without special tools in making a permanent screw hole. The screw holes are made of brass, to make them just as nearly permanent as possible. The uses to which they could be put are obvious to any builder.

Nobby Cement Home

Advocate of Comfort and Convenience Makes Strong Argument for Two-Story Style as Compared With Bungalow Type

By A. C. Irwin

A cozy two-story home of solid concrete wall construction.

In certain parts of the country the one-story house or bungalow has been the type in most demand. In fact, this "fad" has so completely occupied the minds of many people that they refuse to consider for a home any other type than the bungalow.

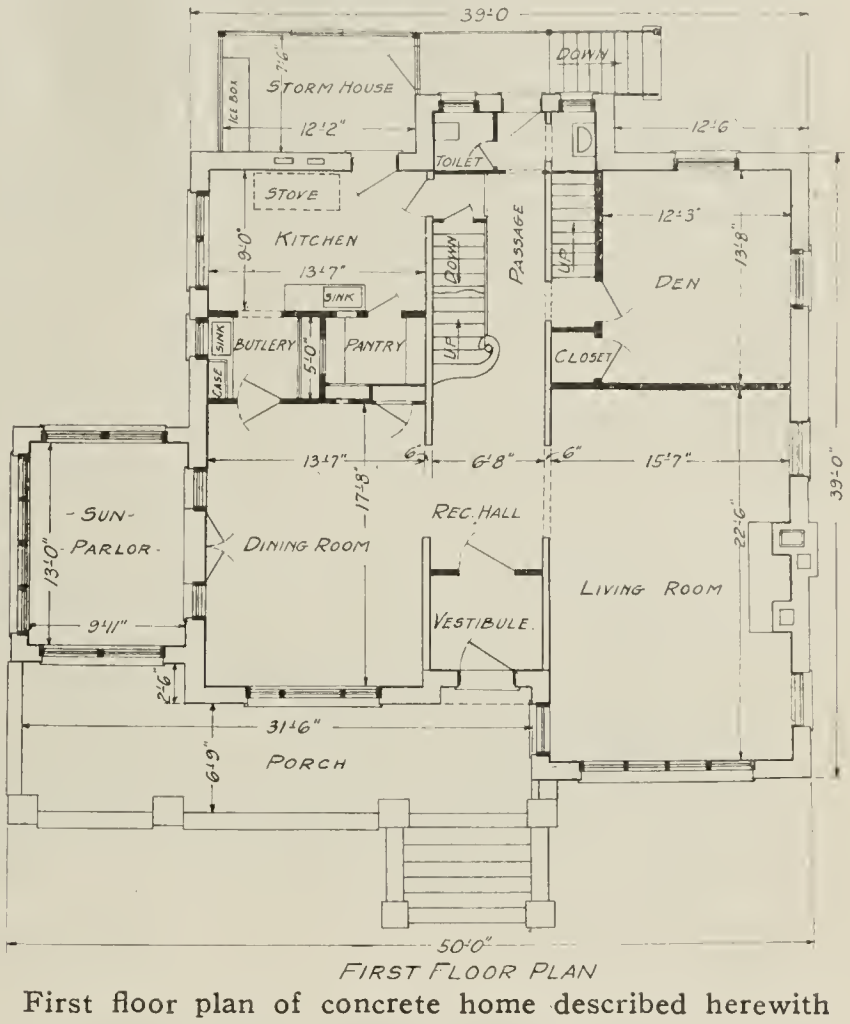
A building surrounded by spacious grounds with large trees and artificial lakes; in short, an environment that simulates an undeveloped condition, is one to which the bungalow lends itself best. In other words, the bungalow is unobtrusive and retiring, and this is the natural role from an architectural standpoint that should be played by the type of residence known as the bungalow. It is not the type that furnishes the height of elevation sufficient to make real architectural rendering possible. At best it is low and squat and spread out. The large expanse of roof is difficult to treat in any way to relieve large areas of unbroken surface. Entrances must be of the simplest character, else they dwarf the remainder of the building.

From a purely economical standpoint it is hard to conceive of a type in which the owner gets less for his money. The excavation and basement for a bungalow cost more than for a two-story residence. This is true also of the roof. In other words, those who are so attached to the bungalow as to refuse to consider any other type must pay the price, not only of additional cost for the same space, but must accept the type of structure that prohibits real architectural treatment in so far as its elevations are concerned.

Bungalow or Two-Story House?

The utility of a bungalow is probably the only ground on which it can be justified. The rooms are all on one floor. Very little climbing of stairs is necessary. This fact, however, is usually given undue importance. As a matter of fact, in a well designed house with sufficient sanitary equipment, trips to the second story are seldom necessary, and, in fact, practically all of the wakeful hours require only the use of that portion of the residence on the first floor. Furthermore, fresh air, sunlight and view, which are afforded from the second story of a two-story building, are cut off to a certain extent in the bungalow type of construction. The privacy and separation of rooms on the second story from those on the first story can never be attained when all rooms are on the same floor.

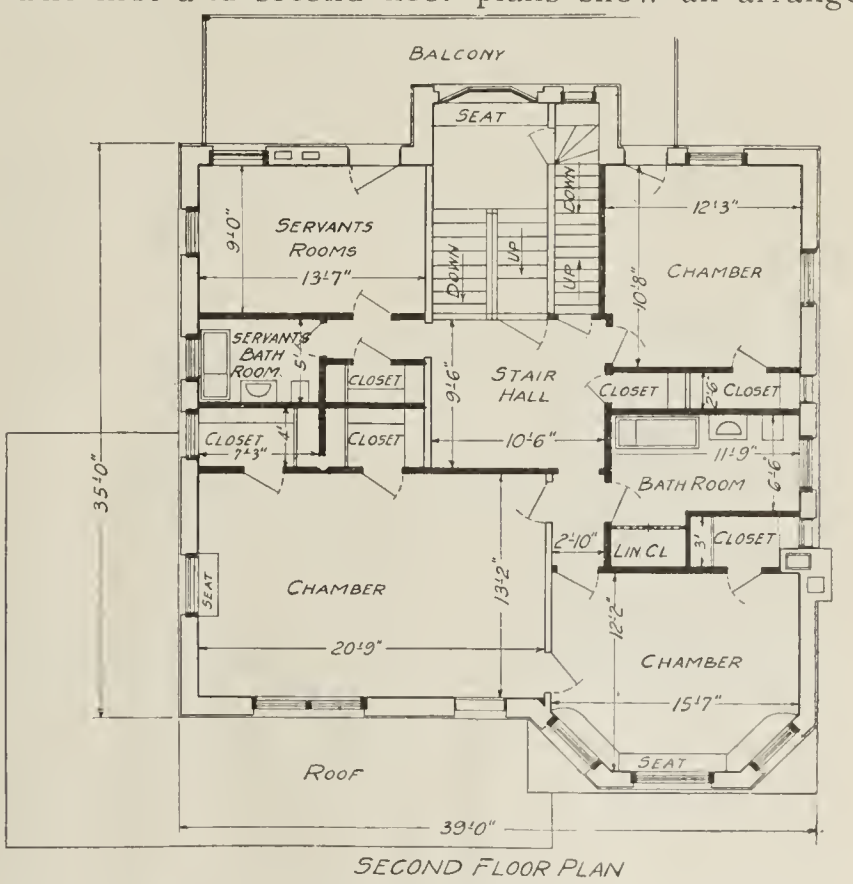
The photograph shown herewith is not only a well designed and attractive two-story house, but has a quality which will appear as peculiar to many readers, namely, it has solid concrete walls. This house conveys an impression of solid comfort, and that proportion which brings to the mind at once the notion which is most essential to all architectural beauty, that is, an innate sense of strength, adaptation, permanence and security.



FIRST FLOOR PLAN

First floor plan of concrete home described herewith

The first and second floor plans show an arrange-



SECOND FLOOR PLAN

Second arrangement of floor of concrete home, built according to novel plans

ment conducive at the same time to comfort, convenience and seclusion.

As just mentioned, this house, near Chicago, has solid concrete walls. It was constructed after what is known as the Fellgren system of concrete house construction, a system invented by Mr. C. W. Fellgren* of Chicago, and has been used in the construction of quite a number of bungalows, apartments and residences in the Chicago district. The system provides a solid concrete wall of any thickness desired, usually 6 or 8 in., reinforced with steel rods. The exterior is finished in stucco and presents the beautiful appearance of a stucco house. Color effects of any sort are obtainable, and the striking effect afforded by a dash coat with granite aggregate may be had. The stucco coats are applied directly to the concrete surface without the intervention of any lath. In fact, a stucco coat properly applied directly to a concrete surface becomes an integral part of the concrete and is absolutely free from any effects of unequal expansion or contraction, since it becomes really a part of the concrete wall.

The Fellgren system provides for wooden studs embedded in the concrete wall, to which lathing is directly applied to carry a plaster finish. A very perfect dead air space is thus formed completely around the inside of the building, and insulation of an effective character is furnished. This calls to mind the oft repeated query in regard to "dampness" in concrete houses. It is well to mention here that concrete walls are no different from brick or other masonry walls in respect to dampness. Furring, lathing and plastering must be resorted to in all types of masonry walled houses, else moisture in the air will condense on cold surfaces of the wall inside the room. This is completely obviated by forming an air space with furring, lathing and plastering.

While the floors of this house are not of concrete, the Fellgren system also provides for construction of concrete floors on which wooden surfaces may be readily applied. This method also forms a dead air space in the floor, which not only deadens the transmission of sound from one story to another, but aids in the insulation and heating qualities of the building. A house with concrete walls, floors and concrete ceilings constitutes a permanent, fireproof, maintenance-free, stormproof structure economical as to fuel. Such a building conveys to the occupant that feeling of security and protection so necessary to complete enjoyment of an abode.

This attractive, moderate priced home was designed by Mr. Andrew Sandegren, architect, Chicago. It was built about eight years ago at a cost of approximately $15,000.

*This system is widely known and approved by the Portland Cement Association, as perhaps the most practicable of its kind.

A Tip to Road Contractors

By M. C. Potter, Bellevue, Iowa

Road supervisors and county engineers in this locality are becoming convinced that it pays to blast down high banks along highways with dynamite in preference to employing old style pick and shovel methods or rooters down by teams.

In most all cases stumps are encountered on top of the banks and gravel or small boulders interspersed through them. The boulders and the roots make it difficult and often impossible for the teams to pull the rooters, and the breaking of machinery or harness and the injury of the horses is of frequent occurrence.

We have found that by putting down holes vertically in the top of the banks, locating them 3 to 5 ft. back from the face and loading them with a few cartridges of dynamite, the size of the charge depending upon the depth of holes and distance back from face, much time and labor are saved. Neither stumps, rocks, nor gravel impede the action of the dynamite. The banks are thrown down into the roadway in loosened condition, ready to be loaded on the wagons and hauled away, or in shape to be drawn away in scrapers and used for fills.

I have actually known of cases where dynamite has thrown down as much dirt as a result of twenty minutes' work putting down and loading holes as teams and rooters could remove in a day and at a cost much less than team and labor hire.

Even when a steam shovel is used, we have found it to be economical to use dynamite in loosening banks, because the steam shovels are enabled to operate much faster on the loosened soil.

This information should be of great value to road contractors in all parts of the country where it is difficult and costly to hire teams and laborers as it is in this section.

Does Rich Concrete in Roads Crack More than Lean?

Recently I had several sleepless nights trying to determine the cause of the small cracks which were appearing in the two-course concrete pavement being laid in this city.

It is almost impossible to find in this part of the country good concrete aggregates suitable for pavement construction. However, the people of this city chose a two-course concrete, using a 5-in. base of a 1:5 mix of a local pit-run gravel. The wearing surface is 2 in. of a 1:2:3 mixture of good, clean sand and traprock from Duluth, Minn.

The pit-run gravel contains a small amount of clay or silt which will pass a 400 sieve. The gravel is also unfit for use, as is shown by results obtained from the application of the colorimetric test. However, upon the strength of the fact that this material had been used as a base for a large amount of sheet asphalt, word was given the contractor that the material could be used.

The first use of the material since my coming to Bismarck was on concrete curb. The mix used was 1:4, laid in sections 10 ft. long. I noticed cracks developing in almost every section of this curb, some of them appearing even before the forms were removed, which was usually about three hours after filling.

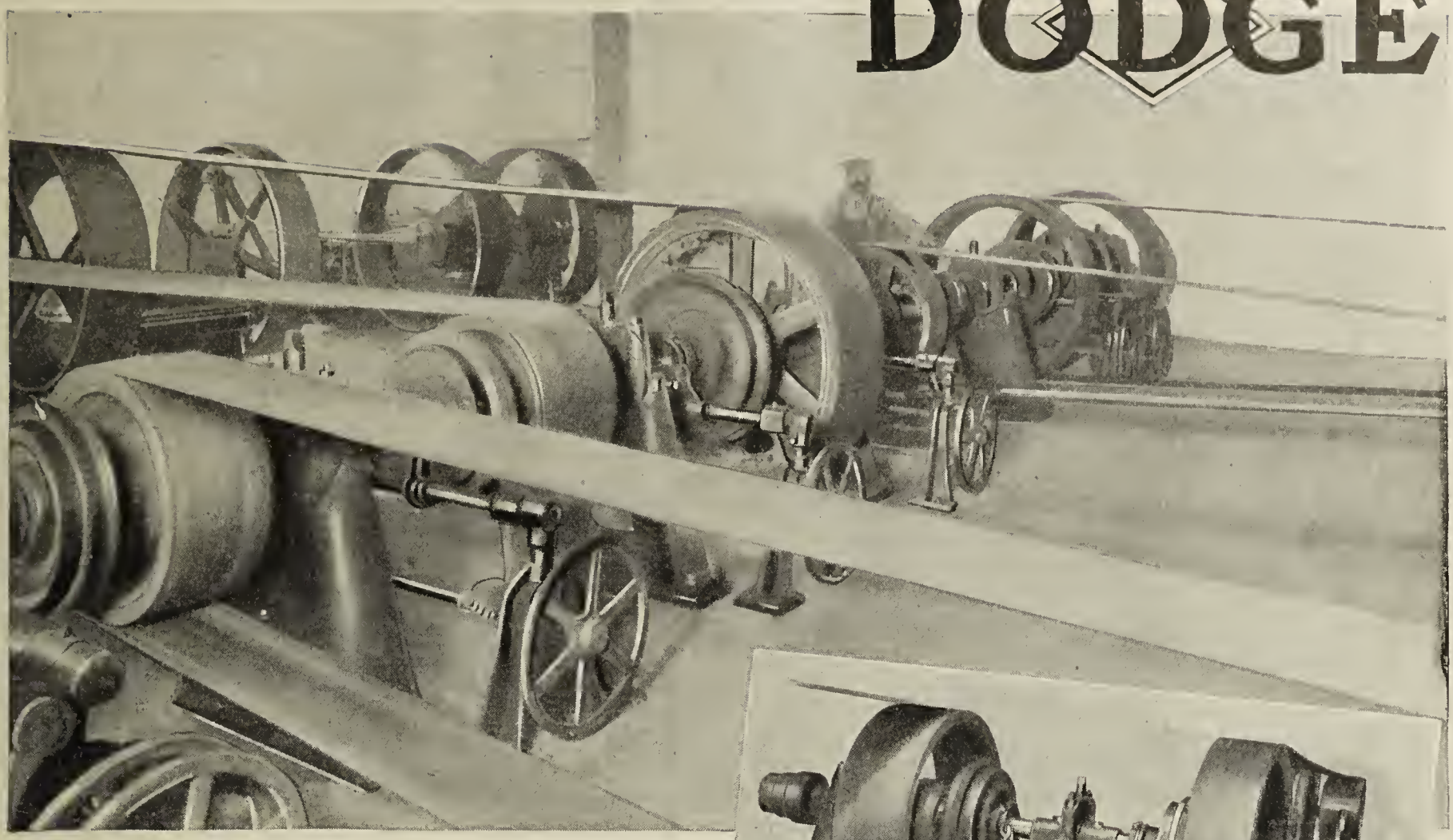
I was positive the cracks were not due to a poor foundation nor to the concrete drying too rapidly. I decided they were due to an excess of fine material which actually increased in volume when wet and decreased rapidly upon drying. The following day I increased the proportion of gravel, using a 1:5 mixture. Only one crack developed on that day's run.

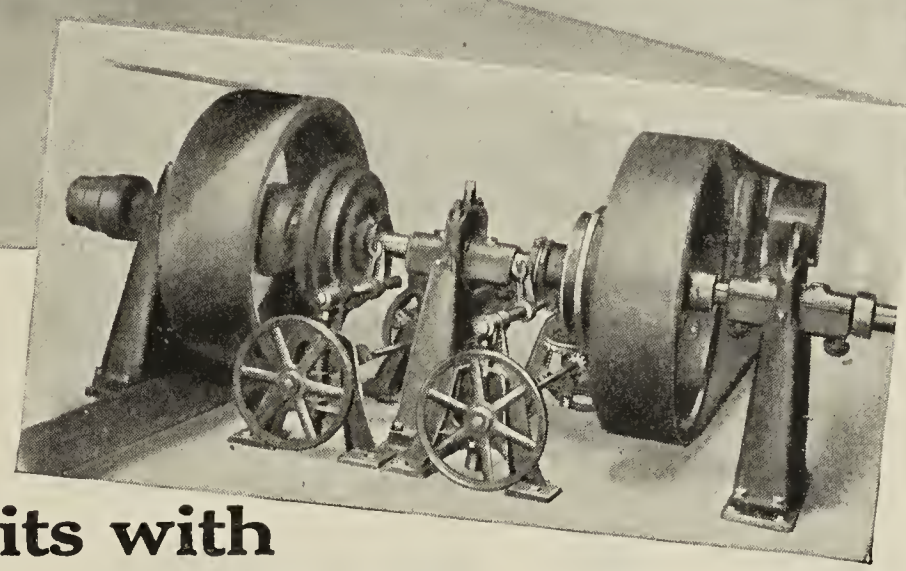
Since starting the actual laying of the pavement, I have noticed a number of these shrinkage cracks appear in the wearing surface. At first I was at a loss to know why they should appear there, but have finally decided that they were caused by intermixing the two courses during a process of placing, and I have overcome this to a large extent by making the contractor mix the base course very dry and tamp it to place.

In conclusion I will say that I do not believe rich concrete will crack more than lean, providing the aggregates used are clean and coarse.

B. H. Tong,
Chief Inspector, Concrete Paving.
Bismarck, N. D.

DODGE





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Sand, Gravel and Crushed Stone for Road Work

It is generally known that the shortage of open top cars during the latter half of the 1919 season has proven to be a very serious handicap to contractors. The reports of the Railroad Administration show that from March until July there is a very large supply of idle cars.

In addition to the large mileage of uncompleted contracts to be carried over into next season we hope, if conditions will permit, to award additional contracts for approximately 1,000 miles of roads. To supply the necessary material for this program will mean a very severe tax upon the material producers unless we are able to extend the construction season. In order to bring this about and thus assist in relieving the open top car situation as well as a possible shortage of materials, the department has decided to pay for such materials as sand, gravel, stones as are delivered without waiting for the same to be incorporated into the work. Vouchers will be issued direct to the railroad company for the freight and to the sand, gravel and stone producers for these materials. The same will be charged against the contractor and the amount thus paid by the department will go to reduce estimates due the contractor as such materials are used.

This arrangement will apply not only to contracts now uncompleted but also to the contracts to be awarded in 1920. In order to make this effective on existing contracts, a supplemental agreement will be made by the department with the contractor and the surety company. This supplemental agreement will be forwarded to the contractor for his signature with the request that he procure the signature of the surety company at an early date.

We trust this plan of handling materials will result in the shipment and storage of a large portion of the aggregate during the early part of the season and thus relieve the congestion both as to care and materials.

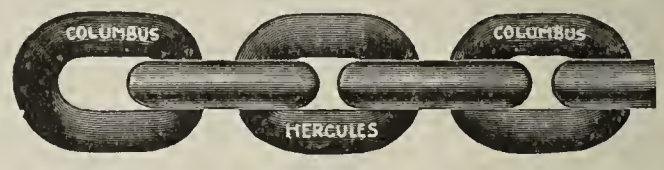
Very truly yours,

S. E. BRANDT,
Superintendent of Highways,
Springfield, Ill.

Concrete Block Company Enlarging Business

As a first step toward a big expansion, Shafer Brothers, conducting a cement block business in Chili Avenue, Rochester, N. P., recently took out a permit to build new reinforced concrete storage bins at a cost of $8,000. It is understood that the company will file plans shortly for new buildings to cost between $70,000 and $80,000.

"HERCULES SOLID WELD"
STEAM SHOVEL CHAIN



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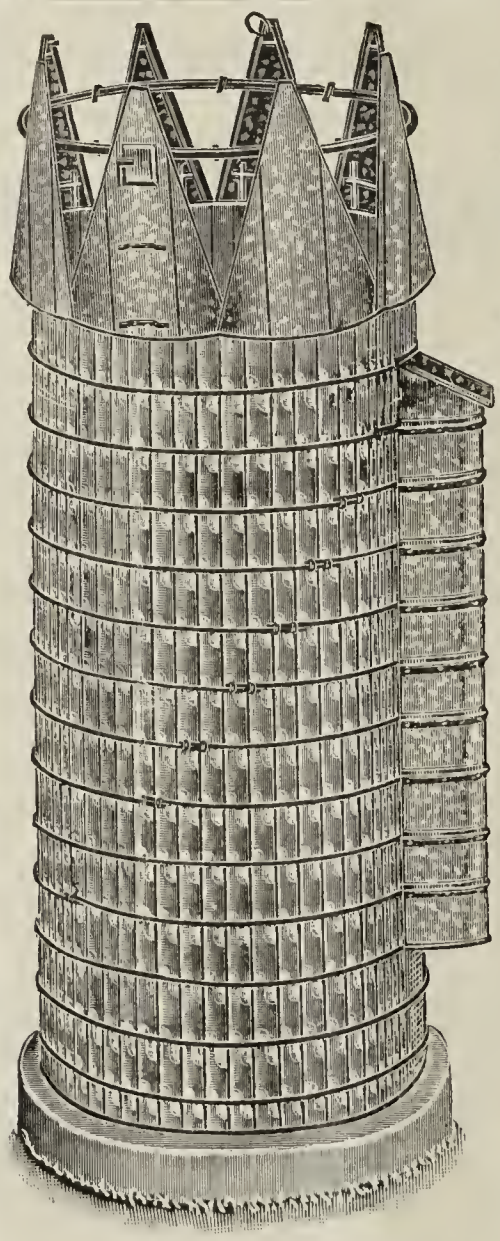


Winner Opening Silo Roof

Offers contractors the strongest "entering wedge" for the silo building business. Adds 6 to 9 feet to silo capacity; makes it easier to fill.

Pays for itself the first year. Easy to put up—and will fit any kind of silo made.

Write at once for full information.

Valley Mfg. Company
277 19th Street
Clinton Iowa

Cement and Engineering News

Vol. 32 Chicago, March, 1920 No. 3

It Pays to Build Well

Among the things we have learned from past building experiences, is that makeshift construction is very costly in the end, no matter how low priced it may seem in the beginning. We are turning steadily toward more durable, safer and more sanitary construction. American homes, as built in the past, while they are convenient and beautiful, have three deficiencies: They are not fire-resisting, not durable and not sanitary.

Builders of modern homes, whether of moderate cost or of the most pretentious kind, demand these qualities. Architects and builders have found that in the concrete house in its various forms, these qualities can be secured at the least cost.

Most home builders have clear and definite ideals which they strive to incorporate in their plans for their new home. Such homes are usually planned with the view to permanent occupancy by the individuals whose ideals they express. They insist on a building which will secure for them the comforts and conveniences typified in the word "home." It must furnish the safeguards that come from a type of construction which is proof against fire and decay. From the investment standpoint, its construction must be such as to suffer least from depreciation, hence requiring the least maintenance.

Concrete houses lend themselves readily to quantity construction. Building operations may be standardized, and the forms used many times. Because of the great demand and the pressing need for more homes in every section of the country, and because of the adaptability, speed and economy of concrete house construction in quantities, concrete is the logical material to use in relieving the present serious housing shortage.

Mississippi Valley States Discuss Concrete Roads

Disapproval of any plans by which a Federal highway commission may build roads without state cooperation was registered by formal resolution at the annual meeting of the Association of Mississippi Valley State Highway Departments, recently held in Chicago. Annual appropriations of Federal funds for road building at the rate of $100,000,000, for four years, 1920-1923, were urged. A decided stand was taken against propaganda being "carried on by the American Automobile Association and other motor interests" to lower motor vehicle license fees, "regardless of circumstances existing in several states in regard to financing necessary highway improvements." Frank Rogers, state highway commissioner, Lansing, Mich., was elected president of the association for 1920 and Alex. W. Graham, state highway engineer, Jefferson City, Mo., was elected secretary.

Two full sessions of the meeting on the third day were thrown open to contractors, materials men and machinery men for a general discussion and exchange of opinion on concrete road construction. Out of the contradictory opinions voiced, the following conclusions appear to be justified: (1) Central mixing plants and wet haulage methods are increasing in favor; (2) heavy rolling of subgrade is a practice which is decreasing in favor; (3) bulk cement is successful where proper equipment is installed to handle it; (4) success in motor truck haulage is determined by road conditions; (5) heavy trucks are being replaced by light trucks with pneumatic tires; (6) aggregate storage practice leans toward tunnels or traveling bins. (7) generally greater weight and durability is necessary in road building equipment; (8) balanced plant requires more careful study.

Materials supply proved the most interesting subject of discussion. Of nine states represented in the association only one, Illinois, is furnishing any construction materials and that state furnishes cement only. The attitude of the contractors present was generally against state-furnished materials unless the states should also guarantee the contractors' losses due to interruption from lack of materials delivered. It was pointed out by the highway officials in their turn that unless better co-ordination could be secured between producers and contractors in keeping up the supply of materials for road construction, the states would as a measure of self-defense be compelled to assume entire control of the task. All states except one in the association plan this year to pay for materials delivered on the job, and properly stored for future work.

Annual Convention of National Crushed Stone Association

About 150 members of the National Crushed Stone Association attended the opening session at The Seelbach Hotel, Louisville, Ky. The call to order by President A. J. Blair was the signal for an enthusiastic outburst. Greetings to Louisville were sounded by Robert Vaughan, prominent attorney and good roads worker of Louisville, and a member of the directorate of the Louisville Board of Trade, the leading business and civic organization here.

Much interest centered in an address by B. D. Pierce, Jr., of Bridgeport and New Haven, Conn., on the subject, "Standardization of Freight Rates." This address was from the viewpoint of the men in the

crushed stone industry, and proved the high spot of the opening meeting for the crushed stone operators.

"Why should the stone industry be compelled to pay more than its proportionate share of freight rates, in the increased revenue of the railroads?" was his pertinent question.

He said this is an actual condition today, and is one which the stone industry should not tolerate.

"An intelligent and equal freight rate should be established on the basis of the conditions under which the freight shipment of stone emanated and moved," was his conclusion. Mr. Pierce says there was no reason whatever why crushed stone should require payment of a higher freight rate than coal, when the details of handling the two commodities practically are entirely similar. He pointed to the absolute need of all other industry to see that the stone industry was favored, saying that in the stone industry is marked the beginning of all business.

Roads, he declared, are all essential, as are buildings, both factory buildings or dwelling places. Without any or all of these there is no call for coal or other commodities which move at a cheaper freight rate, he said.

Co-Operation is the Big Theme

Ways and means whereby the National Crushed Stone Association can render service to the stone industry was the subject of considerable discussion. Co-operation was the big theme, and standardization and peak production at a time when demand is maximum were other points touched by speakers who actively participated in the round-table talks.

Ways and means of improving car service and freight car haulage also was discussed. Speakers laid emphasis upon the need of a special kind of car equipment for hauling stone and stone material, declaring the need here was just as positive as the need for special types of cars for hauling coal. Committees were appointed to consider this matter with a view to bringing about some desired action, the executive committee being instructed to act with regard to rates as well as special equipment.

The need for strong organization to put the stone industry in a position where it can demand the recognition of other industries was strongly expressed by delegates attending the convention. This importance of the industry was discussed by A. P. Sandles, of Columbus, O., who said that this business, in which millions of dollars are represented and is one in which there is close reation to home building, road building, bridge building, the steel industries and agriculture, is in a position to demand reasonable concessions from railroads.

Officers for the association were elected Tuesday afternoon as follows: President, John Rice, Easton, Pa.; first vice president, B. D. Pierce, Jr., New Haven, Conn.; second vice president, E. J. Krause, St. Louis.

A. J Blair, of Milwaukee, retiring president, was elected to the board of directors and the following members were re-elected: W. W. Boxley, Roanoke, Va.; Thomas McCroskey, Knoxville, Tenn.; W. Scott Eames, New Haven, Conn.; Dwight C. Woodbridge, Duluth, Minn.; R. B. Tyler, Louisville; A. A. Hall, Piqua, O. The directors met Wednesday afternoon and appointed a secretary-treasurer.

"Good Roads" was the keynote of the addresses which followed the annual banquet in which many members of the American Road Builders' Association joined.

The speakers were drawn from the ranks of the two organizations, and, in addition, brief talks were made also by Dr. Ben L. Bruner and Dr. A. T. McCormack.

F. C. Biggs and other members of the Canadian delegation, who are attending the road builders' conventon, spoke briefly.

Among the other speakers were J. A. Duchastel, S. L. Squires, Fred Ellis, of Boston; A. L. Blair, retiring president; John Rice, the newly-elected president; W. W. Boxley, Colonel Ritchie, U. S. A., and George P. Coleman, president of the American Road Builder's Association.

A. P. Sandles, secretary of the association, presided as toastmaster.

Madison Stave Silo Company Growing Concern

Five years ago the Madison Cement Stave Silo company was located in Madison, Wis. Today this enterprise is contemplating erection of an all-year building to take care of its increasing business.

From 15 silos, built in Wisconsin the first year, the business has expanded to more than 300 silos the past season. Enough silos have been built by this company to store 100,000 tons of food a year, which means a saving of 40,000 tons of food stuff, according to agricultural authorities who say silos save 40 per cent or more of the material than when stored in any other way.

Starting the first year with a small territory around Madison, securing a location on track through the efforts of the Association of Commerce, the business has reached out until it includes all of Wisconsin and Minnesota.

The first year's pay-roll was less than $800. The past year the pay-roll was $25,000.

Today the company has branch establishments in Boscobel and Sparta, Wis. It expects to establish a branch in southern Minnesota this season and possibly one in northeastern Wisconsin. Local agents are employed in all of the teritory covered by the company. The plans under way will make it possible for the company to make prompt deliveries any place in either state.

Years ago the University of Wisconsin advocated that farmers erect silos. More silos are now being erected in Wisconsin than in any other state in the middle west. The silo, as a saving institution on the farm, earns both ways—it produces more stock food from the same acre by conserving the whole crop, and the result in increased milk and butter-fat from the same corn through being fed in its most nutritious instead of its dry fodder state has been proven beyond a doubt.

The Madison Cement Stave Silo company is owned and controlled by J. Ray Tusker and C. C. Woody.

Minnesota Block Makers Organize

A banquet, attended by representatives, from 60 Minnesota towns outside the Twin Cities, was held at the West hotel, Minneapolis, recently at the conclusion of the first annual convention of the newly organized Minnesota Cement Block Manufacturers' association.

Addresses were given by W. D. Stewart, of the St. Paul Builders' Material company, and E. H. Nordblom, of Landers, Morrison, Christiana company, Minneapolis.

Motion pictures were shown illustrating the construction of a building of concrete blocks.

Members were urged by the speakers to make better blocks, and to advocate building homes of concrete blocks.

Minutes of the Second Annual Meeting of the Iowa Cement Stave Silo Association

By H. E. Kilmer, Secretary, Oskaloosa, Ia.

Tuesday, January 27, 1920

The second Annual Meeting of the Iowa Cement Stave Silo Association was held in the rooms of the Des Moines Chamber of Commerce on January 27th and 28th, 1920.

The meeting was called to order at 1:30 for the registration of persons present and 32 people registered at that time.

The Chairman of the meeting, Mr. C. J. Perkins, then made a few remarks and introduced Mr. G. E. Hamilton of the Chamber of Commerce, who made an address of welcome. In this address he gave all of the members of this Association a hearty welcome to make use of their club rooms and other facilities—not only at Association time, but at any other time they were in the city, and he told them furthermore if at any time the Chamber of Commerce could be of use to them, not to fail to call upon them.

Mr. Chris Nelson of Sac City then talked on the "Sales outlook for the present year." He pointed out that from all appearances there was going to be a greater demand for silos in Iowa than in the past, even at the higher price which we must necessarily ask for our product. Mr. Sig Anderson and others then spoke on the same subject and it was the universal opinion that a good many more silos would be sold this year than last.

Mr. John Thompson, editor of the Homestead, spoke on the subject of "Why every farmer should have a Silo," and in order to help the different manufacturers in selling their product, he has made this in the form of a selling talk between a silo salesman and a farmer. A copy of this talk is being enclosed and we believe you can get a lot of good out of this little talk.

Mr. B. L. Carpenter of Newton then opened the discussion on "How can every silo manufacturer profit by co-operation," and he pointed out one or two concrete examples where he and his competitor had gotten together and they had both made a good deal more money out of their business. He brought out the fact that before he had had an understanding with this competitor, he always took for granted that what others told him was correct and that he found upon thorough investigation, that the farmer was simply telling him that his competitor had offered a lower price when in fact there was little or no difference in his and his competitor's prices. He suggested that the best way to eliminate this trouble would be for every silo manufacturer to become intimately acquainted with his competitor and that they work together, and that they could make more profit and still sell to the farmer on a fair and square basis.

Mr. John Irey of West Liberty then talked on "What is a Fair Selling Price, and Why." In this he gave us the exact cost of the silo from the time he begun to make the stave until it was completed, and a copy of his costs are enclosed. In the discussion which followed his talk, it was moved and seconded that a committee of 5 be appointed to go over his figures and arrive at an average cost to manufacture and construct a 14x40 silo, and that this committee report later as to its findings. The following committee was appointed: W. A. Caldwell, chairman; W. B. Trost, John Irey, A. T. Rausmussen and A. C Newcomer.

The meeting was then adjourned until 6:30, when the New Monarch Machine & Stamping Company gave us an excellent 5 course dinner, and we are compelled to say that they took care of the affair in a mighty acceptable way and we believe that every fellow who was present will agree with us in this opinion

At 8:15 the party was all taken to the theatre and attended the performance as guests of the Chamber of Commerce. A mighty good time was had.

Wednesday, January 28, 1920.

The meeting was called to order at 10:00 o'clock and inasmuch as Mr. Frank Henderson, who was to talk on the subject "The Effect of Stover Silage on the Silo Industry," was not present, a general discussion on this topic was had. It was pointed out by different members of the association that altho Stover Silage was probably all right and would in time become of general use in feeding, that for the good of the silo industry as a whole, it would be best to let the farmer do this experimenting himself. The reason for this was that various farmers have tried this and have not had the success that they should have had, due probably to their not filling the silo properly, or because of not adding a sufficient amount of water. In many cases this trouble was laid to the silo and even more so if the silo manufacturer had recommended this form of filling. We want to keep in close touch with the situation but not be too hasty to take on either the sale of the machine to cut this Stover silage or in recommending it to the farmer.

Mr. A. W. Clyde, Secretary of the National Cement Stave Silo Association of Chicago, then talked on the subject "Why Cement Stave Silos Are Superior Silos." So many points of superiority were brought out by Mr. Clyde that it would be impossible for a detailed report to be given at this time. Suffice to say, however, that you can recommend cement stave silos to be the best silo that can be built for the proper storing and curing of ensilage. You cannot go too strong on this point.

At 11:00 o'clock the persons present were invited to membership into the association and a number responded. The meeting then adjourned until 1:30 p. m.

In the afternoon we were given some splendid talks by Prof. R. F. Stevenson and W. A. Foster of the Iowa State Agricultural College at Ames, on "The facts brought out by 1919 experiments and observations of silo feeding and construction." They brought out the fact that not only did the farmers actually make a great saving in the actual cost of putting 100 pounds of weight on live stock, but that by putting the feed in the silo he would be enabled to feed almost twice as many cattle or sheep with the same acreage, thus doubling his profit. These men were more than enthusiastic over silos and they were equally sure that cement staves made as good a silo as could be erected.

The committee on the cost of silos then reported as follows: "Altho in some intances Mr. Irey's cost was perhaps a little higher than some of the other manufacturers, they found that he had omitted to add any overhead whatsoever—that is, pay for his own time, which should be at least $30.00 per silo, and also that in most cases a chute was included by the manufacturer in their selling price, whereas he did not include a chute, therefore, it was their opinion that Mr. Irey's estimates were not very far out of the way and that it was their honest opinion that in most of the cases a 14x40 silo actually does cost somewhere between $600 and $650. Mr. Irey's selling price for a 14x40 is $880 which does not give him an extraordinary large field for profit. As compared with wood and tile prices, taking the building into consideration they would be about the same, and you are building

them a superior silo. It was the committee's opinion that every manufacturer in Iowa has been building and selling silos for practically what they cost him, and that a very substantial increase in price should be made."

It was moved and seconded that a vote of thanks be extended to the New Monarch Machine & Stamping Co., Chamber of Commerce, Mr. A. W. Clyde and the Portland Cement Association, and the different persons who addressed the convention. Carried.

It was also moved and seconded that $2.00 be collected for every silo built last year, from the members of the association, to be used for advertising purposes and that this advertising start at once.

In the election of officers the following were elected: C. G. Perkins, president; Chris Nelson, vice president; H. E. Kilmer, secretar-treasurer. Executive committee: B. L. Carpenter, W. B. Trost, A. C. Newcomer, E. C. Pringle, and John Irey. Publicity committee: W. A. Caldwell, Frank Henderson and Grant Brayton.

The meeting then adjourned.

The Future of America for the Year 1920

By George M. Reynolds, President Continental and Commercial National Bank of Chicago

A veritable stampede of buying characterized the year 1919. Under pressure of unprecedented demand the products of farm, furnace and factory have remained at fancy prices.

All year there have been complaints of the high cost of living. Everyone must begin to realize that there are only two ways of cheapening food, fuel, clothing and luxuries. One is by the practice of sensible economy; the joy ride of the spenders causes prices to soar higher and higher. The other way, and both are imperative, is to increase production. There cannot be much lowering of prices until more goods are made and more food is produced in the world.

Bank deposits have been high throughout the year. The gratifying growth in savings accounts indicates that, contrary to the general rule, some people wisely are laying aside part of their earnings.

We still have many unsolved problems. Fortunately the financial condition in the United States is sound, the Federal Reserve system and the banks abundantly able to meet every legitimate requirement, but it might better be understood now than later that the time to curb speculation in land, commodities, farm products and securities is at hand.

Plenty of Crushed Stone, Sand and Gravel for 1920

A condition has resulted effective all over the country, a natural sequence to excessive promotion. The cry of a shortage in nateral aggregate for the road building program of 1920. It would seem that every manufacturer of machinery and material used in road making has appointed himself an apostle to preach this shortage to the public in order that there may be no possibilities of a curtailment of his own industry by the failure of the mineral aggregate industry to meet the demands. The echo has been taken up by each state and county, and the idea spread still further until today every farmer paying a road tax and each contractor who contemplates road building in 1920 is asking where are the aggregates coming from? We can never get them.

The self styled apostle supplies relief. He advocates by letter, by publication, and even sends men out to urge the building of the "side of the road plant," and pictures a golden opportunity for capital to invest in permanent stone, sand and gravel plants. If you wish to see such misguided propaganda at its best, procure a copy of the October and November issues of the Portland Cement Association Bulletin, and see them at work. This is only one of the many.

The originators of this propaganda are either greatly misinformed or grossly ignorant and selfish to say the least in the advancement of such arguments. Every producer of sand, gravel or stone in the United States knows if he had half a chance he could produce three times his very best record, and if the demand be still greater he could double that in sixty days by additional equipment. No thought has been given of the fact that road building requirements for aggregates are always crowded into, at the greatest, three months of the year. Spread the distribution of the requirements for road making aggregate from April 1st to November 1st and the present producers will supply all the demands. Add to this a square deal on the distribution of open top cars, and they will have to hire extra salesmen to dispose of their excess tonnage, all municipal and building demands included. These facts in our own state have been verified by careful canvass of the available supply under the proposed system of distribution. We can supply six times the demand for road building if the maximum amount proposed was constructed. Yet these manufacturers persist in flooding our state with articles that more plants must be constructed. It is further more absurd to advise new capital to enter the field for every producer knows that new sand, gravel, or stone plants not backed by experienced operators seldom "produce" in any quantities for three years. By that time we may face an entirely new situation, more serious perhaps to the new capital.

There may be sections of this country where at present there are no facilities for producing the road making material required, but if it is practicable to produce aggregates in that locality a nearby producer will know about it and see that the demand is supplied in a proper manner. If there should be a locality where by chance some ardent manufacturer of road making supplies discovers shortage not being provided for by the present industry, he can serve himself best by asking an experienced producer to work out the difficulty instead of advertising blindly for more producers in a field already overcrowded.

The Mineral Aggregate Industry is big enough to stand alone at least, and if forced too far, I fear some manufacturers will be surprised to find it can walk and perhaps kick. Individually every producer can in his own locality combat this incorrect information, and let us begin now. My one thought in writing this is in hopes it may have some little effect in correcting the harm already done and perhaps slowing up the impetus of this idea.

Yours very truly,
I. M. CLICQUENNOI,
Wisconsin Sand and Gravel Co.

Factory Made Reinforced Concrete Products

The Massey Concrete Products Corp., People's Gas Bldg., Chicago, just issued a 24 pp., including cover, 44½" x 7¾", an attractive booklet, printed in two colors, describing, illustrating and giving design data on the extensive line of products made by the Massey company, including culvert pipe, telegraph poles, battery wells, telephone booths, tiling, sewer pipe, fence posts, trestle plans, meter boxes, and so on.

Owner Protection in Building Construction

How Costs Are Kept Under the Cost-Plus-Fixed-Fee Contract; Books Kept at Job Office—Open for Owners' and Architects' Inspection

By F. A. Wells, Vice-President and Treasurer, Wells Brothers Construction Co., Chicago, Ill.

No contractor who values his capital can afford to do without adequate cost records, both as a check on the job in progress and as a basis for future estimating. Yet the simpler that system of accounting, the better, and any refinements further than those necessary to give the actual required data are a waste of time and money. Some contractors keep their books under their hats or in the left-hand pocket of their coats, where all invoices go preparatory to paying. At the opposite extreme are firms who maintain a complicated system of accounts, both at the job and at the home office. Accounting methods sufficient for the lump-sum contract may be insufficient for the cost-plus-fixed-fee contract, under which the owner and architect must have access to the accounts at all times.

We have found the following system to be adequate for cost-plus jobs and with only a few changes this is the system put into effect on such typical work as the four warehouses we have built for Montgomery Ward & Co., at Chicago and Kansas City, the Butler Brothers' Chicago Mail Order Warehouse, Rand McNally & Company's Chicago Publishing House and other similar work in this country and Canada.

Occasionally we have found an owner who prefers to be given such data as will permit his own accountants to keep a complete system of books. Generally, however, our accounts, kept on the job and open at all times for inspection, are considered sufficient, in view of the detail statements we render to the owner every two weeks—bearing the approval of the owner's representative, who is designated for that purpose. We urge owners to have their auditors frequently make examinations of accounts for their own satisfaction.

The system we are now using is briefly the keeping of a:

1. Cashbook, Voucher Record and Ledger, combined;
2. Invoice and Payroll Register, combined;
3. Detail Cost Record;
4. Accounts Payable Record (Vendors Accts.).

1. The Cashbook, Voucher Record and Ledger is used for the recording of all cash received, cash disbursed by vouchers and all journal entries.

2. The Invoice and Payroll Register is used for the recording of all invoices and payrolls. The invoices and payrolls are numbered consecutively. This Register has columns for date, invoice number, Vendor's name, total amounts, both Debit and Credit, and individual columns for the 20 main accounts used in distribution of costs. The Register represents an absolute detail control of all approved charges to the job as only audited and approved items are given a register number or entered. The payrolls are given register numbers and approved the same as invoices. The office copies of all invoices are filed in numerical order in an ordinary letter file drawer, and bound in numerical order, in lots of 50 to 100, using an ordinary heavy file folder for cover, clamping the invoice to the folder.

3. The Detail Cost Record is used for the recording in detail the distribution of costs among the main accounts as shown on Invoice Register.

4. The Accounts Payable (or Vendors' Accounts) Record is used for the recording of all invoices from Vendors. After the invoices have been entered in the Invoice Register and Detail Cost Record Book, they are entered as a Credit to Vendor in Accounts Payable. Each Vendor has a separate page or sheet. After entry is made, it is placed in file under Vendor's name until ready for payment. When payment is made same is vouchered and charged to accounts payable (Vendor's account) and cash credited.

Office Routine of Purchase Order, Invoices and Voucher

Issuance of Purchase Order—In Quadruplicate—The original of order is sent to Vendor, the duplicate is filed numerically (which forms order Register), triplicate is filed in Open Order file—(Vendor's Name Order), quadruplicate—(which forms material receipt or tally sheet) is filed by the office material clerk awaiting receipt of material.

Receipt of Material—Upon receipt of materials, the office material clerk checks and signs the material receipt portion of the order and file completely with supporting delivery tickets, etc., awaiting invoices.

Checking and Auditing Invoices—Invoice upon receipt is checked against material receipt or tally sheet for receipt of material. Extensions, prices and footings are checked and certified. Cost distribution is checked and entered. Invoice is then audited for discount and cost distribution and certified. Invoice then passes to the superintendent for his approval and the approval of the owner's representative.

F. A. Wells.

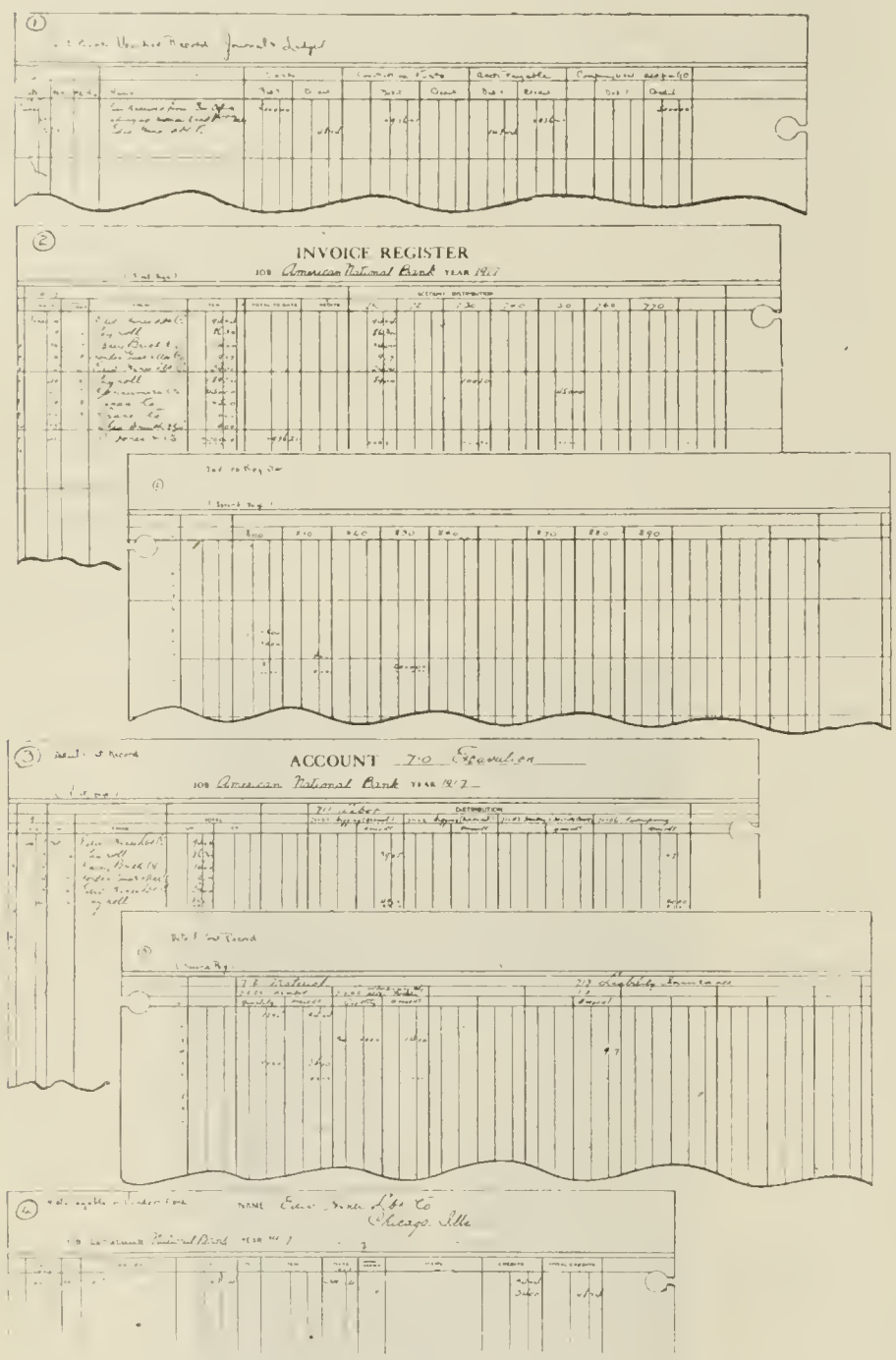
Entry of Approved Invoices in Invoice Register and Vendor's Account—Upon return of approved invoice from the superintendent, the bookkeeper gives the invoice numerical register number and enters in the Invoice Register. Only fully approved invoices are given register number. Invoice is then posted to the credit of the Vendor in Accounts Payable account and a charge to the Detail Cost Record.

Journalizing Accumulated Totals of Invoices Registered to Ledger—Accumulated totals in the Invoice Register are journalized in the Ledger (which is also the voucher record) at daily, weekly or semi-monthly periods as is found practical.

Voucher Check—We have found the voucher check

system to be the most convenient. The voucher is made in quadruplicate at the construction office on the job and the approval of the owner's representative is always indicated on all copies of the voucher. The check, or original voucher, goes to the Vendor, the duplicate to our general office for our records, the triplicate is kept as the job record and the quadruplicate is the "Owner's Copy" which is forwarded to the Vendor with original to be receipted by him and returned. At intervals we furnish the owner with statement showing vouchers paid and receipted vouchers attached.

Since the major purpose of cost accounting is to give an adequate basis for future estimating it is important that so far as practicable the form of cost accounting shall follow the form of estimate. This



is not practicable to the last subdivision of each of our general accounts, but sufficient to permit intelligent use of all cost figures. With such figures it is possible to compare not only final costs, but costs at any stage of the job, with the original estimated cost for that portion of the contract. We frequently divide our estimate by floors, in the case of a many-storied building, in order to have a check upon quantities and upon expenditure at several stages of the work.

Distribution of Accounts

We use the decimal system of classification of accounts. The classification numbers 100 to 600 inclusive and 900 are for our general books which embrace the assets and liabilities, revenues and income accounts—we will omit these in our discussion of construction cost accounting in connection with Cost-Plus and Fixed-Fee contracts.

The general distribution is under the following headings:

700 and 800 Construction Costs—(Summary of General Headings)	800 Plant Expense
710 Excavation	810 Field Overhead
720 Caissons	820 Extra Work
730 Footings	830 Subcontracts
740 Trench and Wall	840 (Subcontract) Extra Work
750 Concrete and Fireproofing	850
760 Masonry	860
770 Carpentry	870 Repair Contracts
780	880
790	890 Company Expense (not chargeable to owner)

The sub-divisions of headings 710-790 are between the items labor (1), material (2) and liability insurance (3). Thus labor in excavation would be 711, Material in excavation 712 and liability insurance in excavation, 713.

A further division of the various kinds of labor and materials is made. The following classifications illustrate this point:

Labor—711	Material—712
711.01 Digging (General)	712.01 Lumber
711.02 Digging, subbasement	712.02 Underpinning adjacent building
711.03 Sheeting and shoring banks	712.03 Rings (steel)
711.04 Shoring adjacent building	712.04 Cement
	Liability Insurance—713

For convenience we have listed the charges of labor and material in the order they usually appear in building construction costs:

Labor	
.01 Digging (General)	.12 Mixing and Placing Concrete
.02 Digging, Subbasement	.13 Building Forms, General
.03 Sheeting and Bracing Banks	.14 Building Forms, Exterior columns
.04 Shoring Adjacent Buildings	.15 Building Forms, Interior columns
.05 Underpinning Adjacent Buildings	.16 Building Forms, Spandrels
.06 Pumping	.23 Lay Brick
.07 Back-filling and Grading	.26 Bend Steel
.08 Cutting Old Footings	.35 Set Cut Stone
.09	.44 Fit and hang doors
.10 Placing Lagging and Rings	.56 Unload and handle material, etc.
.11 Ventilating	.60 Clean up rubbish
Material	
.01 Lumber	.11 Nails and Wire
.02 Underpinning Adjacent Building	.12 Clamps, Purchased or Rented
.03 Rings (steel)	.13 Tile
.04 Cement	.14 Protection (Lumber, etc.)
.05 Sand	.15 Terra Cotta
.06 Stone	.16 Granite
.07 Brick	.25 Frames and Sash
.08 Wall tie and Inserts	.30 Interior Trim
.09 Steel (Structural)	.35 Coping.
.10 Steel (Reinforcing)	

Add as many new accounts as are needed.

Should charges be made in connection with con-

crete and fireproofing under subdivision 750, they would follow the same order as in excavation:

751.12 (Labor)—Mixing and Placing Concrete
752.04 (Material)—Cement
753 Liability Insurance

Or, Carpentry—Subdivision 770.

771.44 (Labor)—Fit and hang doors
772.25 (Material)—Frames and Sash
773 Liability Insurance

Classification of Plant Expense

Subdivision 800 covers plant expense and conforms with the sub-classification of the 700 accounts as much as practicable.

The following are the headings under 800:

801 Excavation
802 Caissons
803 Footings
804 Sawmill
805 Concrete and Fireproofing
806 Masonry
807 .....
808 .....
809 General (Items charged to general equipment)

A further typical subdivision of the accounts under this heading is:

801 Excavation
801.1 Transportation (of Equipment Plant)
801.2 Erection of Equipment
801.21 Labor
801.22 Material
801.3 Equipment on Charge and Credit Basis
801.31 Labor
801.32 Material
801.4 Rental of Equipment
801.5 Fuel, Lubricants and Power
801.6 Repairs
801.7 .....

Should charges to Plant in connection with concrete and fireproofing be made, they would be charged as 805 with divisions shown above.

Field Overhead

810 Salaries, General Labor and Expense
811.1 Supt and Engineers
811.2 Office Employees
811.3 Materialmen and Time-keepers
811.4 Laying out Building
811.5 Watchman
811.6 Waterboys
811.7 Toolmen
811.8 Lia. Ins. Supt. and Watchman
811.9 Trav. Exp. Supt. Engr. and Office men
812 Engineering Expense
812.1 Plans, Detail and Eng. Supplies
812.2 Photographs
812.3 Engineering Service
812.4 Architects' Fees
812.5 .....
812.6 .....
812.7 .....
812.8 .....
812.9 .....
813 Office Expense
813.1 Rent, Light and Heat
813.2 Stationery and Printing
813.3 Telephone
813.4 Telegraph
814.2 Permits and Licenses, Boiler Inspection
814.3 Fire Insurance
814.4 Legal Services
814.5 Burglar Insurance
814.6 Association Dues
814.7 Advertisements
814.8 Floor Tests
814.9 Ring Tests
815 .....
816 Temporary Structures (Labor and Material)
816.1 Offices
816.2 Toilets
816.3 Toolhouse, Blacksmith Shops, Storage Sheds, etc.
816.4 Stairs and ladders
816.5 Fences, Sidewalks, Covers and other enclosures
816.6 Temporary Platform and Driveways
816.7 .....
816.8 Repairs and Protection to adjacent property
816.2 Protection to Public Utilities
817 .....
818 Temporary Light, Heat and Power
818.1 Light
818.2 Heat
818.3 Power
818.4 .....
818.5 .....
818.6 .....
819 General Cleaning
819.1 Labor
819.2 Teaming
819.3 .....
819.4 .....
819.5 .....
813.5 Postage and Expressage
813.6 Rent on Adding Machine and Typewriters
813.7 Furniture
813.8 .....
813.9 Misc. Off. Expense, Towels, etc.
814 Other Fixed Field Expenses
814.1 Bonds (Maintenance and Construction)
820 Extra Work
821.1 Use as many numbers as accounts charged
822 .....
830 Subcontracts
831 Wrecking, Excavating and Shoring, etc.
831.1 Wrecking—Contract
831.2 Excavation—Contract
831.3 Shoring—Contract
831.4 .....
832 Heating, Plumbing, Wiring, Elevators, etc.
832.1 Sub-heading for each kind of subcontract
833 Interior Construction
834 Painting and Glazing
835 Millwork
836 Roofing
837 Fireproof Doors and Windows
838 Interior Finish
839 Structural Steel
840 (Extra Work) Subcontracts
841 Subheading for each kind of work done
850 .....
860 .....
870 Repair Contracts (for small Jobbing Contracts)
890 Company Expense (not charged to Owners)
891 Subheadings for each kind of expense

Detailed Statement of Construction Cost

At stated periods we take from the cost records a summary and detail statement of construction costs in the following form:

Acct. No. Name of Acct. Item Amount Cost per Unit Est. Cost. Diff.

The last column is in black or red; naturally the red items will have careful scrutiny to ascertain why costs are running above estimate. This statement is primarily for our own use, but the owner may have a copy if he wishes.

Owner Knows Total Expenditure at All Times

Under the cost-plus-fixed-fee contract the owner generally furnishes the funds to finance the contract. We maintain an entirely separate bank account for each cost-plus contract representing the owner's funds, and where agreeable to the owner, we arrange for the owner's representative to countersign all checks drawn by us on this account. At the start of the work we furnish an estimate of the anticipated amount of labor and material bills covering an initial period of two weeks or more to the owner, who then advances the funds to cover these requirements. When the owner's receipted copies of vouchers covering this period are returned from the vendors, a statement is given to the owner showing amounts actually paid for payrolls, materials and sub-contract work, with receipted vouchers attached. That total is then credited to us by the owner on account of contract.

The advantages of having all accounts handled at the job are apparent. The distribution, if not clear from the purchase order, can be referred to the superintendent and the fact that the books of accounts are at all times open for the owner's inspection, is an assurance to him of honest treatment. The fact that

he approves purchases of materials before made and again has the opportunity of questioning invoices prior to payment, leaves the control with him and prevents the accumulation of minor, disputed items, which if left for settlement until the completion or the contract, might not be readily explained.

But a system of accounts, no matter how perfect, cannot influence the cost of work except as it points out from time to time divergence from the preliminary estimate and unless such differences are promptly taken in hand, the reasons investigated and the remedy applied. The success of work under the cost-plus contract is still dependent upon the integrity of the contractor and his ability to perform.

We have used this system of accounting with entire satisfaction to firms mentioned above in this article and to many others such as the Wm. Davies Company, Ltd., the largest packers in Canada, the Robert Simpson Co., Limited, Toronto, for whom we built originally on the cost-plus-fixed-fees basis and from whom we have received many repeat orders, being now engaged in work at Halifax on this same basis. This is adequate proof that the cost-plus contract is workable and that the owners not only feel safe but prefer this method because under it 90 per cent of the savings under the preliminary estimate accrue to the owner, because the 10 per cent retained by us is a reasonable incentive for us to make every possible saving and because additional costs incurred through no fault or omission of the contractor are rightly chargeable against the builder and should not reduce and wipe out his profit. There is incentive for the contractor to make all possible savings under both old and new contract and some of the savings must go to the contractor to give him that incentive. Ten per cent we believe to be adequate and the 90 per cent going to the owner builds up for us a good-will account which practically assures repeat orders as new work becomes necessary. The building of a relationship which will insure repeat orders is just as important in contracting as in merchandising.

The Bluffton-Lewisburg Quarries

The capacity of the Bluffton, Ohio, plant of the Bluffton-Lewisburg Stone Co., general offices, Lima, O., has been recently increased by the addition of a motor driven 48-in. Symons Disc crusher. This machine enables the increased output of small sizes. Should it become necessary the plant's entire output, 1,000 tons per day, could be reduced to ½-in. material.

At this plant a close record has been kept on the cost of dynamiting. A steam operated well drill is used and 5-in. holes are drilled at the rate of 60 ft. per ten hours, either one in back of the other or zigzag; the first row 12 ft. and the second 24 ft. from the face. A charge of 90 lbs. of powder is used per hole, which is filled with fine stone chips. The discharge is effected by two detonators per hole and a 220-volt electric current. The output of this plant is mostly for roads, concrete work, and railroad ballast.

The Bluffton-Lewisburg Stone Company, owns and operates six crushing plants in Ohio and Indiana. The stone taken from their quarry at Lewisburg, Ohio, is 98.47 per cent calcium carbonate, and the company has an order for 25,000 cars of this limestone from a large cement plant in Michigan.

The United Cement Products Company, Indianapolis, Ind, has been incorporated with a capital stock of $100,000 to take over the business of the Perfection Septic Tank Company. The incorporators are Charles F. Surface, M. R. Hyman, A. Q. Jones, Myron Rinker and John L. Clough.

Sand, Gravel and Crushed Stone Materials for 1920

According to figures contained in a letter recently sent out by Mr. Thomas H. McDonald, Director of the Bureau of Public Roads, addressed to the State Highway Departments, there is available for expenditure in highway construction in 1920, $633,000,000 which at an average cost of $20,000 a mile will build 31,650 miles of roads requiring 125,000,000 tons of aggregates. This does not include street paving, maintenance of existing highways, erection of buildings, nor railroad improvements. On the basis of the foregoing figures therefore, a total of 275,000,000 tons of sand, gravel, crushed stone and slag must be produced and transported if the prospective construction program for the year is to be carried out.

It must be apparent to everyone therefore, that there must be the greatest degree of co-operation between all parties concerned, including producers, contractors, Highway Departments, private and public consumers and the railroads, if the delivery of materials is to be made possible. Steps are already being taken by the railroads to secure a larger tonnage carrying power than existed this year. But this of itself will not be sufficient to meet the tremendous demands for transportation of these materials unless the great volume of work to be done is distributed fairly over the entire season.

County commissioners can materially assist in this by letting their contracts early and by insisting that the contractor start his work as early in the spring as possible. Another very practical solution to the forthcoming problem will be for the contractors to provide storage at points of delivery and on site of the job whenever practicable. In this way the contractor can be storing his material in the spring and be assured of having his aggregate at the same time.

In order that the contractor may arrange for storage, he should be allowed estimates on delivered material whether in storage at unloading stations or on the site of the job. The State Highway Departments and Boards of County Commissioners should make it known that such estimates will be allowed providing the contractors decide on the storage plan.

We are making these suggestions to State Highway Commissioners of Indiana, Ohio and Michigan for their careful consideration believing the road building departments, producers, contractors and railroads should join hands in order to meet the gravest problems which have ever confronted road building agencies.

Very respectfully,
THE GREENVILLE GRAVEL COMPANY.
Guy C. Baker.

Joins Sales Organization of Traylor Company

Mr. Ben Haislip who for the past four years has been connected with the Chicago office of the U. S. Rubber Co. as sales engineer, on January 1, 1920, joined the sales organization of the Traylor Engineering & Mfg. Co. of Allentown, Pa., makers of the famous "Bulldog" Jaw and Gyratory Crushers, Traylor Heavy Duty Crushing Rolls and complete Cement Mill and Smelting Plant Equipment.

Mr. Haislip who from 1904 to 1905 was with the Allis-Chalmers Co., and from 1905 to 1916 with the Power & Mining Machinery Co., will be connected with the Chicago District Office, 1414 Fisher Bldg., of the Traylor Company in the capacity of sales engineer and assistant to Mr. L. J. Hewes, district manager.

Advantages of Cement Stave Silos

General Specifications for Good Silos—Construction Details—Pointers on Building the Silo—Table of Capacities

As the economy of feeding silage depends in part upon the efficiency of the silo, it is necessary that the silo be:

(1) Airtight, (2) Waterproof, (3) Ratproof, (4) Windproof, (5) Fireproof, (6) Permanent.

Airtightness—No doubt the most important requirement is that the silo be airtight. Silage spoils owing to bacterial action, which cannot take place unless air is present. Cement stave silos are so built that it is impossible for air to reach the silage through the walls.

Watertightness—It is necessary that the walls of a silo be watertight, not only to prevent entrance of water from the outside, but to prevent silage juices from escaping. The individual staves of which the cement stave silo is made are watertight and when laid up, the joints between them are sealed in such a manner that there is no leakage. In proof of this, instances are cited where cement staves have been successfully used for building water tanks of moderate height.

Ratproofness—Rats and mice will gnaw their way into silos, if possible, to nest in the silage. The holes which they make allow air to enter and result in considerable silage being spoiled. Rats and mice cannot gnaw through concrete.

Windproofness—Cement stave silos are windproof. They have withstood tornadoes which have leveled other silos and all surrounding structures. The weight of the cement stave silo is a great point in its favor. There is no need to tighten or loosen hoops. It is unnecessary to attach guy wires to keep it from blowing over. Once properly erected, the cement stave silo is up for all time.

Fireproofness—On the average farm there are few means of fighting fire, therefore a silo should be fireproof. Cement stave silos have successfully withstood very severe fires. If they are built with a concrete chute, not a pound of silage need be lost through exposure to fire. A cement stave silo will protect the store of winter feed against such happenings. After a dry season when other feeds are very expensive and the farmer has nothing that can be substituted for his silage, its loss means far more than its ordinary actual value. There are many instances on record where the burning of a silo has not only cost the owner his silo and its valuable contents, but has made it necessary for him to sell his stock because of having no feed, and consequently has driven him out of business for a season or two. A cement stave silo will make certain that the farmer's dairy plant can be operated without interruption.

Permanence—Cement stave silos are permanent. Many of them built 12 years ago are in as perfect condition today as when new. Concrete grows tougher with age. There is no outlay for upkeep and repairs, no painting, no mortar joints to fill, no holes to patch. A cement stave silo will make large returns yearly for many years.

One of the many points in favor of the cement stave silo is the ease and speed with which it can be built. Four men are usually required to do the work; two above—one to set the staves, and the other to follow and plumb them—while two men below hoist the staves and help with scaffolding.

Although there is some variation of method prevailing among the different stave manufacturers or systems of building stave silos in joining the staves together, all of these methods are being used with reasonable satisfaction, the slight differences are not of great consequence, and occasionally give an intending purchaser the opportunity to select a type which most appeals to his personal fancy.

Size of Staves—Common types of cement silo staves are 28 to 30 ins. long, 10 to 12 in. wide, and 2½ to 3 in. thick.

Continuous Doorways—Cement stave silos can be built with continuous doorways from top to bottom without weakening the structure. Specially designed door frames of concrete or steel are used, and both types have given excellent satisfaction. Door openings are usually about 24 to 30 ins., which allows plenty of room to get in to remove the silage. Convenient ladder steps are provided and doors fit tightly into door frames so as to keep out air.

Cement Stave Chute—At slight additional expense a cement stave silo can be equipped with a cement stave chute which is also fireproof and will protect the silo doors from fire. The cement stave chute is a feature of all new cement stave silos and can readily be attached to silos now in use. A permanent chute adds greatly to the appearance of the structure and is an economical and inexpensive addition.

Building the Silo

Excavation for the foundation is made to a point below possible frost penetration to prevent the structure from heaving by frost action. A solid concrete foundation is then put in, usually so that the floor of the silo will be not more than 4 ft. below ground level. This depth is considered most satisfactory, as it is not too deep for convenient removal of the silage for feeding.

In the first course of staves set upon the foundation, full and part length staves are alternated. This starts the breaking of joints which is maintained to the top row and which is finished with alternate full and part length staves. As each course of staves is placed in position, a steel band or hoop is put on and tightened. After all of the staves have been set, the hoops are again tightened to take up any remaining slack. The inside wall of the silo is then painted with a thick cement and water wash. This fills any water pockets on the surface of the staves and seals the seam between adjoining staves, giving a smooth, even, air-tight and water-tight surface.

Thus a cement silo can be built in less time than any other type of masonry silo. An average size is usually built complete in 3 days, although in many cases, where all conditions have been favorable, they have been built in 2 days. The staves may be hauled by the farmer any time when he is not busy. The silo crew is on the farm only a short time and does not interfere with the regular farm routine.

A Silo Built by the Local Products Man Is a Good Investment

There are hundreds of cement stave silos in the central western states which have been giving perfect satisfaction for periods up to 12 years. The cement stave silo is manufactured of home materials and by home labor, and erected by a home contractor who must depend upon local business and therefore stakes his reputation on his work right in his neighborhood. The buyer hauls the material to his farm and the contractor sends his expert crew to erect the silo. This not only relieves the farmer of building, but makes it possible for the cement stave silo contractor to give the farmer a real guarantee covering workmanship and materials and thus to protect him against loss.

Capacity of Round Silos in Tons

*Height	Diameters					
	10 ft. Tons	12 ft. Tons	14 ft. Tons	16 ft. Tons	18 ft. Tons	20 ft. Tons
27½	41	58	81	...	...	...
30	46	67	91	119	...	...
32½	52	75	102	134	...	...
35	58	83	114	149	188	...
37½	64	92	126	163	208	...
40	70	101	138	180	229	280
42½	..	111	151	196	249	304
45	..	121	165	215	269	330
47½	..	...	...	232	289	356
50	..	...	...	250	310	382

*Heights are given in intervals of 2½ ft., the length of most common types of cement staves.

Close Regulation Makes Winter Concreting Safe

By G. A. Stockhus, Ross P. Beckstrom Construction Co., Rockford, Ill.

Workmen schooled in the methods followed and trained to leave nothing to chance make concrete construction in cold weather entirely safe. With the functioning of the human element thus assured, the mechanical equipment needed and the methods employed are so simple that they are within the means of any building contractor. They are the only means employed by the construction company with which the writer is connected, and it has never been compelled to stop work because of winter conditions.

An example of winter concreting procedure is furnished by the three-story concrete buiding, 156x66 ft., under construction at Rockford, Ill. In preparing to concrete a floor of this building, care is first taken to stock-pile all the aggregate required so that the heating apparatus may have 24 to 36-hr. action on the material before any is used. There must be absolute certainty that no frosted material gets into the mixer, and long heating is necessary to give this assurance.

On this operation the steam boiler is large enough to run four steam lines into the sand and gravel and also a 1-in. service line to the floor to be concreted. This line is branched off into lines laid along the center of each bay and the full length of the building. These branch lines have connections for steam hose. With the hose, column and beam forms are steamed out just ahead of the pouring until there is no possibility of accumulated ice or snow remaining. The corrugated dome forms in particular are steamed carefully, as ice forms easily in the corrugations and, being transparent, is easily overlooked. It is the sole task of one man to do the steaming, keeping just ahead of the pouring operations.

Steam-operated mixers are, for safety, employed in all winter work. They are less liable to be shut down by winter conditions. The heated materials are mixed with boiling water so that the concrete virtually begins to set as soon as it is deposited. As fast as the slab is poured it is covered with a thin tarred paper on which is spread about 6 in. of wild slew hay. This slew hay holds the heat much better than tame hay or straw. Within 48 hr. after the floor is poured and protected as described the column forms for the next floor can be erected. As each story is ready it is closed in tightly by canvass side curtains. Great care is taken in placing these curtains to close every opening by which air enters. Salamanders keep the inclosed space warm.

The practice employed embodies no new methods or appliances, except in the one respect that every procedure is carefully watched and no single thing is left to chance. On this care, and in the training of the workmen, rests the success of winter concrete-building construction.

Interesting News Items

The pulverizing department of the Gouverneur Limestone Company, of Gouverneur, N. Y., was compelled to shut down by the breaking of the base of a large pulverizer. An unsuccessful attempt was made to weld the break by the acetylene process, but a new base had to be installed. The company has a large contract for fluxing stone, and is very busy in the grit department.

One of the twentieth-century ideas in labor saving equipment has been adopted by the Arundel Sand & Gravel Corp., Baltimore, Md. This company will build a new iron conveyor system for handling its products at a cost of about $6,000. Like all up-to-date organizations of the present day they have an eye for greater efficiency. The Arundel Corporation does an extensive business in the Baltimore district, and is very much alive to every opportunity to increase business and give better service.

The Island Sand & Gravel Co., Columbus, O., a subsidiary of the Columbus Consumers Supply Co., will soon have its new sand and gravel plant in service at the foot of Mohler St., and will be ready to supply the ever increasing demand for building materials. The new plant is modern in every respect equipped with a dredge and electrically operated tipple. With this working force the concern will be able, and expects to do, several times its former business.

The Bangor Cast Stone Products Co., Bangor, Maine, which is doing a big business in gravel, crushed stone and other building materials in addition to the "cast stone" produced by the company, is to install considerable new machinery and other apparatus which will greatly increase the output and efficiency of the plant, according to an announcement by George Cuozzo, the general manager.

Two publications of the Portland Cement Association, Conway Bldg., Chicago, Ill., constitute valuable additions to the literature concerning the varied uses of concrete. One of these is a booklet about the employment of concrete tanks for industrial purposes; the other is a bulletin describing concrete highway grade crossings. Both are excellently illustrated and will be appreciated by builders and others.

J. C. Donaldson, formerly with the Portland Cement Association—Farm and Cement Products Bureau, has resigned to accept a position as superintendent with the Granette Products Company of Des Moines, Iowa. This company will soon have its new plant ready to manufacture ornamental concrete burial vaults, monuments, tombstones, street and highway signs, posts of various types, including electric light standards, cast stone trim, etc.

Sand Lime Brick Convention

The annual convention of the Sand Lime Brick Association was held last month at the Lafayette Hotel, Buffalo, N. Y. The manufacture of bricks and various new experiments in this trade were discussed. About 50 brick manufacturers from all parts of the United States were in attendance. W. H. Crume of Dayton, Ohio, is the president of the association.

SERVING SERVANTS

Methods in Force in the Lehigh Cement Plants to Avert Accidents

The Great Corporation Has Worked Out an Elaborate System of Inspection and Protection.

Mr. C. A. Swiggett, superintendent of the Lehigh Portland Cement Company, Iola, Kansas, addressed the Rotary Club recently, in which he outlined the methods followed by his company to secure so far as possible the safety and health of its employes. The organization of the Lehigh Portland Cement Company for Safety Work consists of a general Safety Committee of which the Superintendent is Chairman. All the Foremen are automatically members of this Safety Committee and besides the foremen, two men are chosen each month from the different departments of the mill to serve on this general committee. Within the general Safety Committee there are separate committees for special purposes.

The Sanitation Committee looks after the Sanitation of the plant and sees that the men keep their lockers and wash rooms clean and that the drinking water is pure and can be secured without contamination by those desiring to drink it. It sees that there are no piles of rubbish left around in the corners for stumbling or other hazards and looks after the general health of the men as much as possible. This committee during the Influenza epidemic furnished throat gargle and laxatives free of charge to anybody desiring them.

The Fire Prevention Committee looks after all the fire hazards of the plant and sees that the chemical extinguishers are in working order; that the water tanks are filled and the water buckets in place; that the fire ladders are in their proper place ready for use and that the full equipment of axes, hose carts, wrenches and lanterns are in the hose houses and that the fire hydrants are in working order.

The Accident Committee looks after the accidents which happen at the plant, reports on the seriousness of these accidents, the number of days the men are off, and makes the rounds of the plant urging the employes who are only slightly injured to get First Aid treatment and to report at the hospital during the doctor's visit, to get medical attention so no infection will start from slight scratches which are not enough to keep the employes from work.

The Educational Committee looks after the Educational work among the men so far as possible to make them realize the danger of being careless, shows them how to perform their work in a safe manner and strongly criticized anybody whom they find disobeying the Safety Rules. They try to show the employes that a careless man not only stands a good chance of injuring himself, but also his companion who may be working with him.

The Inspection Committee makes inspection of the plant, sees that all the guards are in proper shape and that new guards are put up where necessary. They see that the rule that all guards taken down for repairing machinery are put in place before the machinery starts again is followed, and they make any small repairs which are necessary from time to time in existing guards. The inspection committee also has charge of all the regular work relating to the installation and maintenance of all guards, and unsafe practices about the plant.

The Publicity Committee brings to the attention of the General Committee anything of interest which is published from time to time by the Portland Cement Association, by the different safety organizations, by the insurance companies, and by the general press.

These committees make weekly reports, which are typewritten, and together with the minutes of the General Safety Committee meetings all these reports are discussed and action taken on any guards which need to be placed on machinery, etc. and this is compiled in a general weekly report which is kept on file in the office and copy submitted to the Special Representative of the Lehigh Company in Allentown, Pa., for his attention and his files.

It is an elaborate organization and to maintain it must cost a great deal of money every year. But the Company has its return in the satisfaction of noting a steadily decreasing number of accidents and in observing the uniformly good health of its employees, while the whole city is glad to know that its industry is conducted upon principles so humane and enlightened and up to date.

Labor Saving Construction Machinery

Every contractor will be interested in the complete line of machinery put out by the American Cement Machine Co., of Keokuk, Ia. This line embraces mixers, pavers, hoists, back fillers, material elevators, pumps, air compressors, saw outfits and concrete carts. The company is located at Keokuk, Ia., where it has access to water power cheap, a saving which is passed back to the consumer in lower prices. Over 6,000 contractors have installed the machines which are giving satisfactory service.

In concrete mixers the line embraces all types from the single bag, 1:2:4 mix, to the 4-bag skid mixer, suitable for large yardage jobs. In pavers the 2-bag mixer is the favorite. The pavers are equipped with the steep sectional chute which it is claimed has proven faster and more dependable than boom and bucket. These are gasoline mixers, which are said to be $10 per day cheaper than the steam mixers.

A special line of hoists is cataloged ranging from the gas or kerosene with double drug to contractors', reversing or non-reversing. Also a line of "all oak" material elevators, pumps for contractors and saw rigs and woodworkers. All who have not seen a copy of the "Boss" catalog should send for one.

Scoop Conveyor

The Portable Machinery Co., Passaic, N. J., has ready for circulation, literature and price lists covering the Scoop Conveyer, which is manufactured in six different sizes. The Scoop Conveyor seems to be particularly adapted to loading wagons and cars from stock piles of sand, gravel, stone, etc. The six types give a wide latitude as to the material handled; each type being more particularly designed to handle one class of material. The literature ready for circulation gives a good idea of these different conveyors in operation.

The Right Belt in the Right Place

FOR every conveyor or elevator condition that exists in the production of cement the United States Rubber Company manufactures a belt made especially for the work it must perform.

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

UNITED STATES RUBBER COMPANY
US
RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Our belting men are

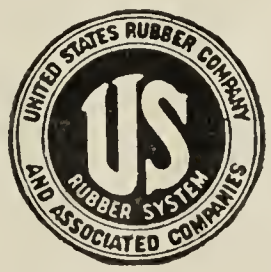
at your disposal. As practical men, who have long specialized on conveyor problems, they are glad to co-operate with quarry and crusher operators with the idea of meeting correctly the actual conditions met in every installation.

Upon the results of this examination are based the weight of duck, the number of plies, the body, and the kind and thickness of cover for each belt.

United States Rubber Company conveyor belts give satisfaction.

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods



News of the Cement Mills

It is expected that it will not be long until the cement manufacturing plant which is being installed in Rapid City, S. D., is placed in operation. The machinery now is being placed in position. With the enormous amount of cement needed by the cities of the Black Hills and other parts of western South Dakota this year it is believed the new industry will be a paying one from the start.

The Beaver Portland Cement plant at Gold Hill, Oregon, under the superintendency of W. H. Green, is now ready to operate. Repairs have been completed and the plant cleaned up ready for a steady run of 1,000 barrels per day. The plant represents an expenditure of nearly $400,000.

One hundred men are employed at the plant with a $10,000 monthly payroll. The quarries have been turning out rock for several days. Shipments of fuel are scheduled for every few days to insure no delay.

The suit of the Riverside Portland Cement Company, Los Angeles, Calif., against the Maryland Casualty Company as surety on the bond of C. B. Davies, notary public, was decided by the appellate court adversely to the plaintiff.

The action grew out of a building contract. The contractor was required to give a bond. The evidence showed that he took Davis to his home, where he had his wife and mother-in-law affix their signatures to a blank bond, to which they took no oath, merely going through the motions of holding up their right hands, and that afterward at the notary's office this amount was inserted and the bond filled out.

The contractor failed to pay for material and a suit followed the filing of liens. The Los Angeles superior court found for the plaintiff.

The LaSalle Cement Company of Chicago, has completed the purchase of the stock of the Ironton Portland Cement Company, Ironton, Ohio. The plant will be operated under its present management for the time being. The deal involved the transfer of a considerable amount of stock.

Superintendent Richard Moyle, of the Marquette Cement Company, stated that the plant would begin again the manufacture of cement this month, after having been closed for some time during the installation of improvements and the finishing of extensive repairs.

During the time the plant has been closed down, practically the entire force has been used in helping to make the new improvements and repairs. The improvements comprise large additions to the plant which will add greatly to its capacity.

Mr. Moyle stated that full operation of every department would begin next week.

Announcement of the intention of the Lehigh Portland Cement Company to establish two large plants in the northwestern part of Calhoun county, Alabama, one at Lagarde and the other near Read's Mill, is considered to be one of the most important business developments of the winter, and has created a great deal of interest in local business circles, says the Anniston, Ala., Star.

The Lehigh company owns approximately 10,000 acres of land in the county, and the announcement that the company will expend $5,000,000 in the erection of the two big cement plants will serve as a stimulus to business attention directed toward that part of the county.

The establishment of the big cement plants will probably bring about a development of the lime manufacturing industry in the Legarde settlement, there being about an eight-mile stretch of mountain stone country there peculiarly adapted to the turning out of that commodity.

Building of a branch line from the two big plants to connect with the Seaboard at Wellington, as well as the building of spurs to reach Gadsden rail connections, are some of the developments promised by the Lehigh company, and as the spring months approach the entire section embraced in the lime rock country will become a thriving center of business activity.

The main offices of the Lehigh Portland Cement Company will be in Anniston, while the bulk of the trade and products generated by the establishment of the plants on the Louisville and Nashville will be handled through branch offices at Gadsden. The company will draw the bulk of its man power from Gadsden and the southeastern part of Etowah county.

Judgment against the Western States Portland Cement company in the amount of $2,484, for Henry Southern, a negro living in Independence, Kansas, was granted by Judge Holdren in district court. The plaintiff sued for $2,999 as compensation for burns received May 31, 1918, when in the employ of the cement company. His legs were burned by hot cement.

The Acme Cement Corporation, Catskill, N. Y., which has been closed since shortly after the outbreak of war with Germany, will resume operation about March 15. A force of about 30 men is employed getting the plant ready to resume operation again. New quarry machinery is being installed. The daily capacity of this plant is 3,000 barrels.

About 60 employes at the Sandusky Cement plant in Dixon, Ill., went on strike recently for increased wages and for a time the lives of other employes at the plant were in danger when at the hour of going to work several shots were fired. Sheriff Frank Schoenholz was appealed to and went to the cement plant where he conducted an investigation into conditions.

It was reported to him that the strikers, consisting of Hungarians, Mexicans, Italians and negroes, had refused to go to work, asking for an increase to 50 cents an hour and time and a half for overtime or Sunday work. They have been receiving 40 cents an hour and a bonus of 10 per cent, it was reported.

Efficient steps to treat "flu" patients have been taken by the Lehigh Portland Cement Company, the Marquette Cement Mfg. Co., and by the Red Cross chapter in La Salle, Ill.

Two nurses were employed. Each will be supplied with an automobile, a chauffeur and the necessary eatables for families who are ill with the influenza, the Marquette and the Lehigh furnishing the autos and other necessaries free of charge.

This positive move on the part of the two big manufacturing enterprises and the Red Cross is expected

to materially alleviate conditions, and will enable many families to weather the privations brought upon them through the unfortunate contracting of this disease.

Increased building activity making itself felt in all parts of the country, is said to be the cause for the new improvements being made in the plant of the Riverside Portland Cement Company, Riverside, Calif., which is just getting back to the before-the-war production basis.

The big blast which was fired a short time ago, and another as large or larger for which the remainder of the mountain is being tunneled at the present time, and which will be ready within a few weeks, will make available a wealth of raw material for immediate use. It is said that the new material being taken out of the big limestone mountain varies in quality, making necessary the re-arrangement of the storage and blending rooms to take care of the larger output that is reported as being planned for the future.

John Treanor, manager, Riverside Portland Cement Company, Riverside, Calif., recently explained the details of the new improvements that are to be made at their plant. He says:

"We are changing our method of handling clinker to and from our clinker storage. At the present time we use a bucket conveyor. The new installation will consist of a derrick. The object of the change is more economical handling of clinker and betterment of working conditions for certain employees. In connection with the change we are providing ourselves with a storage for gypsum, which is quite largely used in cement manufacture. The improvement will give employment to some twenty or twenty-five men during the period of erection, which will be short. It appears from a telegram received today that the derrick cannot be delivered for six months, so nothing of importance will take place until August or September.

"The design of this change is naturally in charge of Mr. C. L. Carman, who designed our plant originally and is always called into consultation when we are making any changes or betterments. Mr. Carman arrived in Riverside several days ago and will remain the balance of this week."

The San Joaquin Valley Portland Cement Co., articles of incorporation of which have been filed with a paid-up capital of $750,000, will begin work on their new mill in sixty days.

The corporation has purchased a tract of 160 acres of land a short distance east of Porterville, Cal., on the line of the Porterville Northeastern R. R.

The mill will have a capacity of 1,000 barrels daily at the outset and will be built on the unit plan to allow for expansion. The company will also grind limestone rock for agricultural purposes, and the cement dust will be converted into potash for use in commercial fertilizers.

For the purpose of purchasing machinery for a new cement plant to be built near Pocatello, Ida., H. C. Day of the Ogden Portland Cement company, Ogden, Utah, left for the east. He was accompanied by Ralph E. Bristol. When Mr. Day returns definite announcement is expected regarding the construction of the new plant.

F. M. Eaton, president, Eaton Laboratories, 340 Sansome street, San Francisco, Calif., has been in Woodland, Yolo county, California, for the past two days conferring with Fred Schaffer of the board of trade and members of the board of supervisors relative to the probabilities of locating in paying quantities deposits suitable for the manufacture of cement in Yolo county, following up the desire of the board of supervisors to establish a cement factory here to supply cement for Yolo county's $1,000,000 county highway system.

Eaton claims that there are three separate deposits suitable for cement in Yolo county, the best being two and a half miles west of Cadanassa. Drilling is necessary to discover its extent. Eaton plans to appear before the supervisors and make a complete report concerning his discoveries and the cost of drilling and establishing a plant here.

The Continental Portland Cement Co. uses the following method in cooling and handling clinker. The hot clinker from the kiln room is conveyed across to the coolers and clinker storage, which are all in one department.

The cool clinker from three coolers is directed to two bucket elevators and is elevated over the cement storage. From this point it may either be chuted to the storage pile on the floor below or to the finishing mills. A cross conveyor is provided so that the material may be returned to the finishing mill. When the clinker is being put into the storage an adjustable arrangement provides so that the clinker may be distributed to the various parts of the storage.

Material put into the storage is reclaimed by being scraped down to these same elevators by an electric hoist driven scraper. It is stated that this arrangement gives the maximum amount of flexibility, for the plant can either finish, fresh clinker, a combination of fresh and stored clinker or entirely stored clinker.

A cement manufacturer in the Central West uses the following method of proportioning limestone and shale at the raw material bins. The mix is controlled by the wet process, and so the raw materials are proportioned by volume instead of weight.

The raw stone and shale are sent to large concrete hopper bottomed bins after they pass the preliminary crushers. Underneath these bins there is a track and passageway, so that a car may run under the chutes and be loaded.

Portland Cement Plants; Wash Mill and Correcting Basin

The F. L. Smidth and Co., Engineers, 50 Church Street, New York City, is circulating pamphlets on the washmill, and correcting basin. In portland cement plants operated by the wet process the washmill is used to prepare the materials either for the preliminary grinders or the finishing grinders, as may be required. The washmill is designed for the manipulation of a soft material with water to form a slurry. The correcting basin is also used in wet process cement plants. With its use, the F. L. Smidth Co. claim that the $CaCO_3$) lime content may be easily and continuously controlled within one-half of one per cent.

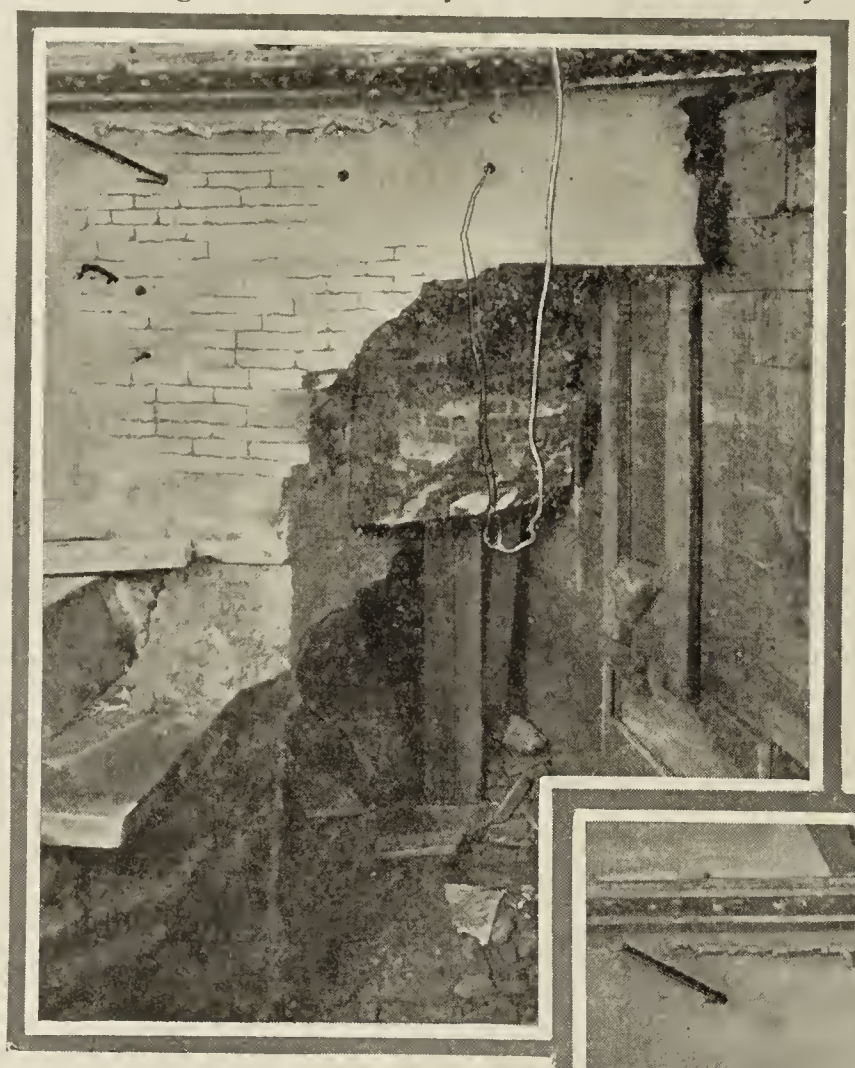
Increasing Efficiency of Sand Screen

It is pretty generally conceded that the ordinary cylindrical screen, when used with a very wet mixture of sand and water, does not screen out all the fine gravel. R. Snoddy, manager of the Coon River Sand Co., Des Moines, Iowa, has increased the efficiency of his fine gravel screen by a funnel-shaped apron on the discharge end, which prevents the sand and water mixture rushing through before the screen has performed its duty.

Blasting Concrete

By S. R. Russel, C. E.

Concrete structures, either plain or reinforced, are considered of the most permanent nature. It is, however, often necessary to remove or destroy such structures. It may be an old concrete wall, bridge abutment or pier, a foundation under a building, the lining of a tunnel, or an engine bed. Many times these objects are inside factory buildings and adjacent to valuable machinery, or the mass to be removed may be in close proximity to buildings, close to a city street congested with traffic, or under an office building.



Old Brick Foundation Showing Location of Hole Loaded with one-third of a cartridge 1¼x8-in. Dynamite and Electric Blasting Cap.

The customary method of removing old concrete so situated is to drill holes with "jumper" steel and sledges by hand labor and then break the material off, bit by bit, with wedges. This is a slow and expensive way to handle work of this kind. The best, quickest, and cheapest method to remove old concrete, brick or masonry is by blasting with explosives. At first thought most people would immediately say that explosives could not be used, as they would crack the walls of the building above or damage nearby machinery and be altogether too dangerous. As a matter of fact, explosives can be used with great economy of time and money, in almost all cases and with absolute safety. As a general rule, concrete is very easily broken by blasting, and experience has shown that the better the concrete, the more easily can it be broken.

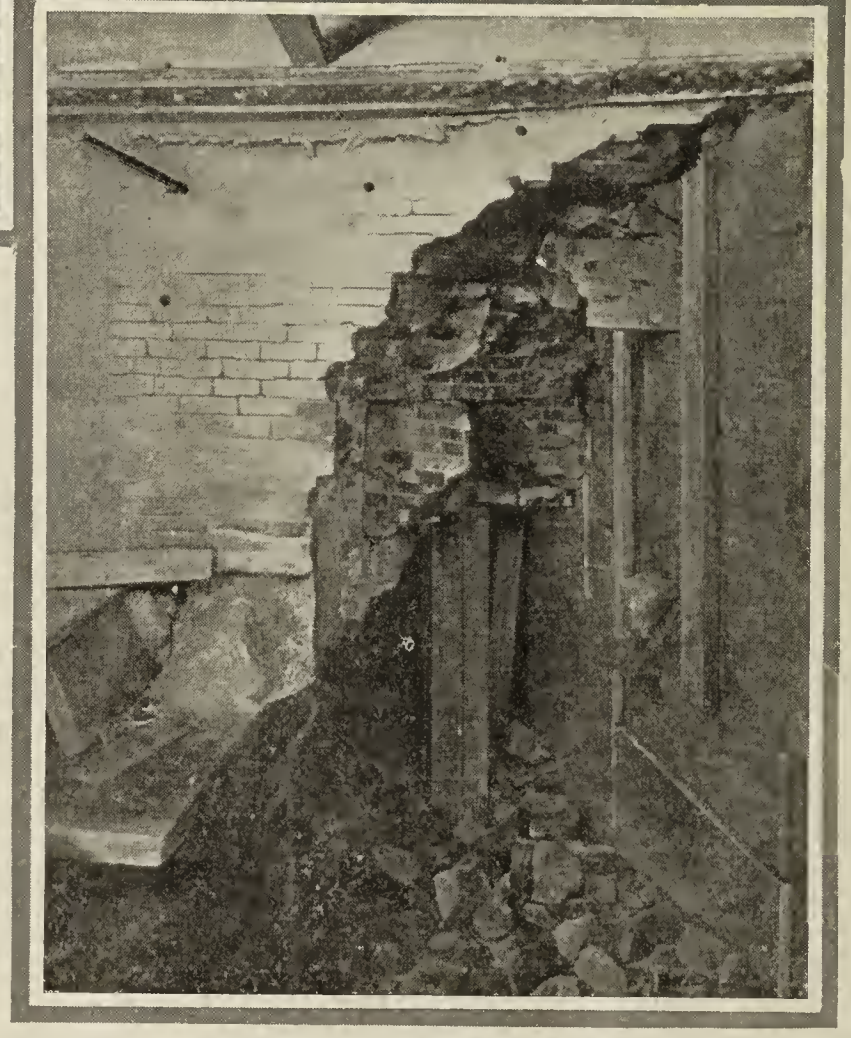
In doing this class of work care must be exercised to see that the holes are properly located—which is true of all blasting—and that light charges of explosives are used. It requires no particular caution or ability to blast old walls or concrete, brick, etc., that are located in open places, where there is little likelihood of damage to surrounding property. But it is in cases where the structures to be removed are located close by and often are a part of valuable property, machinery, buildings, etc., that care and a nice sense of judgment must be exercised.

An explosive of relatively slow-heaving action, like Red Cross Extra 30% to 40% strength, is best adapted for such work, rather than a very quick and shattering explosive.

The drilling of holes is best accomplished by the use of self-rotating hammer drills, but when the size of the work does not warrant such equipment, holes can be drilled by hand, using "jumper" steel and sledge. It is best to demolish the structure by gradual steps, or benches, or, in other words, a little at a time, especially if located inside or under a building. Holes are drilled, as a rule, from 1 inch to 1½ inches in diameter, the depth depending upon the thickness of the material. In general, 6-foot holes are about as deep as should be shot in close quarters.

If the object is a vertical wall or abutment, probably the best way to crumble it would be to drill a vertical line of holes from top to bottom, spacing the holes 3 feet apart and 3 feet from the edge of the free sides of the wall. The depth of these holes should be equal to three-quarters the thickness of the wall, and a safe yet efficient charge would be from one-third to one-half cartridge of 40% Red Cross Extra 1¼ inch x8 inch dynamite loaded in each hole. Each hole should contain an electric blasting cap, which should be wired "in series" and fired by means of a blasting machine.

In this manner the object can be broken in sections. Another method more applicable when the wall is in the open and not adjacent to damageable property, would be to drill a row of holes along the bottom of the wall, about 2 feet from the ground and equal in depth to three-quarters the thickness. Holes should be drilled with a slight dip. A charge of one-half to three-quarters cartridge of 40% Red Cross Extra 1¼ inch x 8 inch, should be loaded per hole, and as many holes as desired fired at one time, unless in close quarters, when it would be better to fire two or three holes at a time. One row of holes so situated would be sufficient for a wall up to 12 feet high and from 3 to 6 feet thick. If higher than this, it is advisable to shoot the wall in two sections, or use vertical rows of holes, or load heavier charges per hole.



Showing Results of Shot.

Brick walls crumble more easily than concrete, do not require as heavy charges per hole and, as a rule, the holes can be spaced farther apart.

In removing an old engine bed or foundation, holes should be drilled vertically to a depth at least three-quarters the thickness of the piece. If there is machinery nearby, or other property likely to be damaged, one hole should be fired at a time. It is difficult to say, definitely, just how to space the holes, because the shape and dimension of the object may be very irregular, but it can be taken as a safe rule to use about one-third of a 1¼-inch x 8-inch cartridge of Red Cross Extra 40% dynamite per cubic yard of material to be broken. Sometimes more can be used with safety, but, as a general rule, if the charge is thus proportioned, the material will not fly, and yet will be crumbled and cracked up so that it can readily be removed by hand labor.

In building the subway under the Philadelphia city hall a great many concrete foundations were built to support the building temporarily while the permanent steel supports were being placed. Later, in excavating for the subway proper, much of this concrete and many old masonry foundations, placed when the city hall was built, had to be removed or tunnelled through to accommodate the heavy steel girders used. For a time the contractors were compelled to remove these obstructions by hand labor, the city authorities prohibiting the use of explosives on the ground that blasting might crack the main walls of the municipal building. Advice was sought of the Du Pont Company, and their representatives, after a thorough inspection, recommended the use of explosives and convinced the city engineer of the safety and efficiency of this method of conducting the work.

Old Concrete Foundation Before Blasting.

Loading the Hole.

As an instance of the time saved, it took two men about four months to drive a small tunnel through the old foundations, 12 feet thick, by hand labor. By using explosives a similar work was accomplished in as many days! As a matter of fact, the contractors successfully removed all the old masonry, concrete and brick walls and foundations in connection with the work, sives, in about three weeks.

The superintendent stated that under the old method it would have taken from six to eight months to accomplish the same results. This work was done without the least injury to the upper or nearby walls of the building. Only a small quantity of explosives was used for the work, but the time and money saved amounted to many thousands of dollars.

In blasting old foundations of concrete or stone, it is undesirable, as a rule, to throw the material, or shatter it very much. Usually, satisfactory results are obtained if the foundation is cracked or crumbled so that a man can pry the concrete apart with a crowbar, especially if the object to be blasted is inside a building. As a precaution, however, it is always well to protect any nearby machinery or buildings by placing old railroad ties, or other heavy timber, over the adjacent structure, or over the material to be blasted. A blasting mat can be used to good advantage in such work.

After the Shot.

In loading the holes it is excellent practice to leave some air space around the explosive when loaded in the bore hole. Concentration is not, as a rule, desired. The dynamite should be loaded into the hole without slitting the cartridge, then a wad of paper should be forced into a point a few inches from the dynamite charge, and on top of the paper sand or clay tamping is used clear to the mouth of the hole. This air space permits a wider spreading of the explosive force and cracks the material up well without undue shattering or throwing too far, a result usually desired in most cases of this particular kind.

A few cases of actual examples might be of interest. An engine foundation, 12 feet long, 4 feet deep and about 3½ feet wide, was successfully broken by drilling three vertical holes, each 3 feet deep along the center line, using one-third cartridge of 40% Red Cross Extra, 1¼ inch x 8 inch per hole. One hole was shot at a time.

An old brick wall built many years ago, about 10 feet high, 4 feet thick and 20 feet long, was entirely demolished by placing a row of horizontal holes 2 feet from the ground, 3 feet apart and 3 feet deep. Each hole was loaded with one-half cartridge of Red Cross Extra 30%, 1¼ inch x 8 inch, and six holes were fired at one time by means of a blasting machine.

An old concrete pier of pyramidal section, 6 feet high, 4 feet x 4 feet on top and about 5 feet x 5 feet at the bottom, was broken up so it could easily be removed by drilling a hole 4½ feet deep vertically in the center at the top and loading three-quarters cartridge of 1¼ inch x 8 inch Red Cross Extra dynamite.

With a little care and judgment there is no reason why explosives should not be used for removing old concrete in all cases, as it can be done at a very great saving of both time and money.

(Note.—The photographs accompanying this article were kindly furnished by the Keystone State Construction Co., Philadelphia, Pa., Mr. F. M. Schwab, Chief Engineer. They illustrate the methods pursued in successfully removing a great deal of old concrete and brick foundations under the Philadelphia city hall during the building of the new subway in that city.

In no case was more than three ounces of 40% dynamite used in each hole, and the work was completed without damaging the upper or nearby walls of the building in any way. Also, the blasting was done without the knowledge of most of the occupants of the building, or without attracting the notice of people on the street, and this in a very congested part of the city.)

Chimney Trust, Is Charge

Five Construction Companies Indicted for Attempt to Restrain Trade

Five chimney construction companies and more than a dozen of their officials were indicted yesterday by the Federal Grand Jury on a charge of having organized and operated a trust in the construction of radial brick chimneys in violation of the Sherman Anti-Trust law.

The allegations are the same as those set forth in similar proceedings. They accuse the defendants of having sought to restrict the business to those allied with the defendant corporations to fix prices and to prevent competing concerns from using the same materials and methods in chimney building.

It is alleged that the "Chimney Builders Association" was incorporated on June 26, 1914, and that the members agreed to send to the secretary of the association written information of every inquiry received from prospective customers and to state each quotation or bid submitted. It is said that weekly meetings were held in this city and that Ashbel P. Fitch was elected secretary of the association, his salary being paid by a tax upon the members. Special Prosecutor Robert P. Stephenson prepared the indictments.

OBITUARY

David L. Heller

Mr. David L. Heller, who was Head Traveling Erection man for the Bradley Pulverizer Company, died in Allentown, Pa., Saturday, January 21st, from influenza, at the age of 45 years. He was with the Bradley company for close on to twelve years, acting in the capacity of Traveling Erector and had the distinction of erecting Griffin Mills and Bradley Hercules Mills in most every section of the world. He was a man of exceptional character and his loss will be felt by a host of friends in every section of the United States. He was connected with the cement business for many years before coming with the Bradley Company.

Standardize Crushed Stone Sizes

In order to facilitate the supply of crushed stone for road purposes, representatives of the highway departments of New York, New Jersey, Pennsylvania, Delaware and Maryland and of the crushed-stone producers of those states met in Philadelphia Nov. 18 and agreed on one standard size for stone. It was found that each state had a different standard, and that this situation resulted in slowing up production, due to the necessity of changing screens and stocking different sizes. The standard stone adopted was that passing a 2¾-in. screen and retained on a ⅝-in. screen. The sizes between these meshes are to be the crusher run.

The meeting was called at the instance of Lieut. Col. W. D. Uhler, state highway engineer of Pennsylvania. Besides the representatives of the stone interests and Colonel Uhler, there were present W. G. Thompson, state highway engineer of New Jersey; Charles G. Upham, state highway engineer of Delaware; J. N. Mackall, state highway engineer of Maryland, and William Treadwell, representing Frederick Stuart Green, state highway commissioner of New York.

More Concrete for Lincoln Highway in Indiana

The Indiana State Highway Commission has just let a contract for the construction of 11⅓ miles of concrete Lincoln Highway in Lake County, extending from Schererville to the Porter County line, the consideration being $373,156.00.

The completion of this piece of permanent construction in accordance with the specifications of the Lincoln Highway Association will mean the elimination of all but four miles of the old macadam road in Lake County, these miles being within the limits of incorporated communities.

The letting of the Lake County contract brings the total of Lincoln Highway permanent construction now under way in Indiana to over $740,000—over 22 miles of new construction.

The Investment Value of a Reinforced Concrete Building

By Mr. J. P. H. Perry, Vice-President, Turner Construction Co., N. Y.

"Investment Value." The thought comprised in these two words is probably what forms the basis of all the reasoning and research of the best business minds in this country today. More than that, "Investment Value" is the question of the moment. The United States during the Great War was the Supply Base of the Allied and Neutral Countries, practically the Supply Base of the World. And now it must turn from a war basis to a base for peace time supplies.

A sunny workroom means happier employees. The interior of the Baer Bros. factory at Stamford, Conn.

It must turn to the production of articles for home consumption which were restricted during the war, and to the production of supplies for foreign nations whose capacity has been crippled by the war. It has not built to meet these demands. And in the first rush to meet the situation the "Investment Value" in a building must be one of the first questions met.

Considering "Investment Value," the manufacturer about to build a factory or warehouse must choose between five principal types of construction as follows:—

Frame Construction.
Mill or Slow Burning Construction.
Brick and Steei Construction.
Fireproof Steel Construction.
Reinforced Concrete Construction.

In considering these different types he must look at them from the points of first cost, speed of construction, durability, maintenance, safety and adaptability. In other words, the Greatest Value for the Investment in a building is the most efficient building with the least depreciation and maintenance and the greatest permanence.

To begin with, in first cost, frame construction is probably the cheapest. This type of construction for a permanent installation may be regarded as failing in all other requirements, even in adaptability. Mill or slow burning construction ranks next in low cost, but at the current rates for brick and lumber, its cost is only about 10 per cent less than that of reinforced concrete. Brick and steel construction costs about the same as reinforced concrete, or probably more, while fireproof steel construction costs from 10 per cent to 20 per cent more, depending on the size of the building.

With these costs in view let us compare the latter four types of buildings as to speed of construction, since the investment in the site and the building will not begin to possess an income bearing value until the building can be used. Consider the materials that go to make up a reinforced concrete building. Cement, sand and gravel or stone, and simple stock sizes of steel rods are its principal components. These commodities are always available. There is no waiting for special sizes of steel and other special materials. The most ordinary sizes of lumber are used to make the forms. No large sized sticks of lumber have to be procured. The cement, sand, stone, steel and lumber can be quickly and easily assembled at the site. They present no transportation difficulties and problems. At the site, they are quickly moulded into a building. It is at the site that these components are moulded without delay into any necessary special sizes. Reinforced concrete can meet the foundation conditions of the other types of buildings, or with large area pedestals or a mat it even makes them easier to overcome. After the foundation is laid the building rises, a floor a week, to the roof and the Investement very shortly thereafter begins to return an income.

Turn now to the durability of Reinforced Concrete building as compared to other types. While most materials tend to rust or decay concrete continues to increase in strength for months, even years after it is built. In fact a four-story reinforced concrete building designed without further reference to erecting another story may have the additional story put on after two years with full assurance that the columns would easily carry the additional load. This is due to the fact that concrete increases in strength something like 49 per cent over its strength in 28 days in the next 16 or 18 months. As a matter of fact many city building departments recognize this increase in strength with age by allowing greater floor loads to be put on an old concrete building than those for which

For handsome appearance there is none that excells the Adriance Machine Works Co., Brooklyn, N. Y., concrete "factory de luxe."

the structure was originally designed. A reinforced concrete building of average size is cast in a solid block. Scientific experiments as well as actual practice have shown that such a building stands up better under heavy vibrating machinery than any other type.

Concrete expands and contracts with changes of temperature. Its co-officient of expansion, that is, its expansion in a unit of length for each degree of increase in temperature is almost identical with steel,

and on this account there is no tendency for the steel to separate from the concrete. They act together under all conditions. There are therefore no temperature stresses to break down the construction of a reinforced concrete building. Vermin cannot attack its structure and the lime in the cement obstructs all parisitic life. None of the above qualities can be attributed to the same extent to the other types of factory and warehouse buildings. With the maximum durability there is the least depreciation on the Investment and therfore the greatest "Investment Value."

Closely allied with first cost and durability is maintenance. Low first cost may quickly cease to show a credit on the Profit and Loss account when maintenance charges are taken into consideration, even if

Although a severe fire raged in the Thonet Warehouse, W. 36th St., New York City, it was confined to the second floor of the building, due to fireproof concrete walls and floors.

the additional item of depreciation is neglected. With Mill or Slow Burning Construction costing 10 per cent or allow even 15 per cent less than Reinforced Concrete it is a fact that the maintenance on a reinforced concrete building is practically nil, while depending on climatic conditions, heat, cold and humidity, the vibrating of machinery, the action of vermin and decay, and special operating conditions, maintenance on mill construction can vary between one and three per cent or even more. It can well be seen that it does not take many years to wipe out that favorable balance on the first cost account.

Safety in an investment against unforseen and total or partial loss is one of the prime factors in the Value of an Investment. An investor buying securities, such as bonds and stocks in the financial markets, must pay for increased safety by a smaller return on his money, or actually as a rule by paying more money for the same return. As regards building, this latter is perhaps true in the case of fireproof steel construction since it entails the highest first cost. But for this higher first cost of from 10 per cent to 29 per cent over reinforced concrete construction it possesses no greater safety. The same principle, the resistance of concrete to heat, makes fireproof steel construction fireproof. As in reinforced concrete the concrete protects the steel reinforcing from damage in high temperatures, so is the structural steel in the more expensive type of building protected by a covering of concrete, or sometimes what produces the same results, hollow tile.

However, a building differs from credit securities in that safety is paid for by annual fixed charges and differs still more since the fixed charges decrease as the safety increases, or exactly the opposite of what an investor might expect for additional safety. The more fireproof the building, the lower the insurance rates: Fire insurance being the most widely known and used, it is most applicable here. However, the concrete buildings that stood up among the ruins of frame, stone, brick and steel buildings after the San Francisco Earthquake should not be forgotten. They combined the stern resistance of the Rock of Gibraltar to the overwhelming earthquake with the safe permanence of the Sphinx among the shifting sands.

Fireproof steel construction and reinforced concrete construction are the only types of Factory and Warehouse buildings that are all that the word fireproof implies. However, very elaborate and complete experiments were performed at the Underwriters Laboratory at Chicago on the fire resistant qualities of the various types of columns, and concrete has headed the list. Strictly reinforced concrete columns have stood up under the load for which they were originally designed at usual building working stresses for eight hours in almost blast furnace temperatures and at the expiration of that time it was necessary to double the load before the columns failed. No other type of construction came anywhere near such a performance.

As regards a reinforced concrete building itself, fire insurance is many times considered unncessary. It is generally desirable to insure the contents when the building is used as a warehouse or for manufacturing inflammable articles. When non-inflammable articles are manufactured insurance expense can be entirely done away with. Furthermore in a great number of cases the considerable expense of installing a sprinkler system can be saved. Even where the installation of a sprinkler system is advisable to protect the contents, a considerable expense in extra apparatus can be avoided with a reinforced concrete building.

To sum up and in addition to the very large differential in insurance costs of non-sprinkler-equipped buildings and their contents in favor of Reinforced Concrete Construction, this differential ranging from 50 per cent to 400 per cent increase on the Reinforced Concrete rate as a basis, this type of construction possesses the following additional advantages as regards safety: It offers security against disastrous fires and total loss of structure; it reduces danger to contents by preventing the spread of fire; it prevents damage from story to story; it reduces danger of panic and loss of life among employees in case of fire. Reinforced Concrete therefore really stands for safety and safety at the lowest cost and greatest investment value.

The remaining quality necessary for the highest Investment Value is marketability. As this applies to a reinforced concrete building it may be known as adaptability and efficiency. In addition to possessing all the adaptable qualities of other types of factory and warehouse construction, this type of construction gives the greatest resistance to the vibration set up by moving machinery. This is not only an advantage to the workers in a building but also a very considerable saving in the adjustment and repairs of machinery

and the relining of shafting, etc. A Reinforced Concrete Building also permits a maximum lighting area for natural light. An ordinary brick or mill construction building has rarely over 20 per cent to 30 per cent of its wall area in windows, whereas the window area for a reinforced concrete building often runs as high as 85 per cent. Where it is essential that floors be water tight, so that water cannot fall upon the product on the floor below or upon belting as in paper and pulp mills and other special classes of manufacturing or where trouble and high maintenance cost are encountered with wooden tanks and vats, reinforced concrete is most adaptable. In the case of warehouses, the hardened concrete or granolithic floor is best adapted to the trucking and shifting of heavy supplies. Generally and specifically reinforced concrete is adaptable and efficient and therefore such a building is always an asset and easily marketable.

During the time when the production of this country is changing from war to meet the demands of peace, the first move must be to house this new effort. Manufacturers and merchants must have buildings, and in these for their money they will seek Investment Value. A balance sheet which includes first cost, speed of construction, durability, economy in maintenance, safety, depreciation, and adapatability will indicate for the greatest Investment Value, Reinforced Concrete Construction.

Hydrated Lime in Concrete

Some dissatisfaction has been expressed with the fact that the U. S. Bureau of Standards has not as yet published a report of its investigations relative to the use of hydrated lime in concrete. In order to correct any possible misunderstanding writes the secretary of the Lime Manufacturers Association, the following information is given:

To accurately determine the effect which lime has on concrete is an intricate proposition; there is so much more to the question than was supposed when the investigational work was started a few years back. The main point is, of course, does hydrated lime produce an increase in the compressive strength of concrete? This whole question of the development of strength in concrete as a general proposition finally has been run down after years of close study by prominent investigators to a point where it is now definitely established that the strength of concrete depends to a very large extent upon the quantity of water used during the process of mixing and placing. This is true whether hydrated lime is used or not. The length of time of mixing, quantity of cement, etc., are factors, which, of course, must be taken into consideration and controlled in making tests, but as mentioned, the quantity of water is the real big element.

Another important factor which must be taken into consideration in conjunction with the development of strength is the workability of the concrete. These two subjects must go hand in hand and be developed together, as it appears now that in effect of lime on workability will rest our whole future campaign.

We know now in using smaller quantities of water the strength of concrete increases, but we know also that when water is used in quantities which produce high comparative strengths the concrete is not sufficiently workable and cannot be placed without excessive labor charges. This is a practical condition which must be met, consequently the larger and excessive quantities of water are used in field work. If the lime introduces into the mixture a degree of workability which permits the concrete to be placed with smaller quantities of water, then the ultimate strength will be automatically increased. Herein lies the problem which must be developed in relation to lime.

Up to the present time there has not been developed a method for accurately measuring the workability of concrete mixtures. This is the problem upon which the Bureau of Standards is now working and it seems likely that it will be developed in the near future. They are at least getting nearer to a solution of the problem. As soon as this has been developed, then we shall be in a position to develop accurate information relative to the effect hydrated lime has on concrete.

Importance of Keeping Belts Clean and Properly Dressed

By G. Arthur Schieren

It has been our experience that you cannot expect good belting to work well when it becomes dirty, dry and hard from lack of attention in keeping it clean and pliable.

This can be done and should be done by cleaning the belts two or three times a year, and applying a good belt dressing.

Belts may be dressed on two or three different holidays in the year, when they are not in operation, and should be turned over slowly and thoroughly cleaned, and then applying the dressing evenly the entire length of the belt—about two-thirds on the cover and one-third on the main band of double belts. Single belts should be dressed on one side only, as they usually run on small pulleys, and, if dressed on the inside, they are liable to slip or creep on the pulleys and become what is termed "pulley-burned."

We might say that one-fourth to one-third of the power now in use could be saved by keeping the belting clean and in a pliable condition, or as nearly as possible to the same condition as when lrst installed, also maintaining the proper width of belt for contact on the small pulley to do the work well, especially where it is to be used on what may be called "short centers." All "short center" drives are what are known as "rigid" drives, and, in these cases, one should add 30% to 40% to the width of the belt in order to maintain the elasticity or recovery.

More might be said in the way of the proper amount of belt surface on small pulleys and short centers, rather than to try and standardize the size of the pulley, as there are thousands of cases where speed of shafting and machines must be maintained and it would be difficult to make a standardization for that reason.

Use Locomotive Crane to Move Material to Pit

A Terre Haute, Ind., sand and gravel company does its pit excavation with a 15-ton locomotive crane having a 38-ft boom and a 1½-yd. clamshell bucket, all enabling the operator to run along the bank and select either coarse or fine gravel, for the material in this bank is not uniform. When there is a surplus of torpedo sand it is stored in a pile near the track by a belt conveyor. In the spring, before it is warm enough to operate the pit, this stored material is sold.

This material is rehandled from the pile to the car by the locomotive crane at a cost of about 5 cents per cu. yd. This practice gives the men early employment and helps the company to have material on the market early. The plant, having a 15-car capacity a day, has discovered that these are practical methods of operation.

The Protection of Concrete Buildings Against Damp

From La Revue des Materiaux de Construction et de Travaux Publics, Paris

General opinion to the contrary, a concrete which is impervious to water is not necessarily impervious to damp. The chief causes of humidity in buildings are: (1) Damp foundations. (2) Dampness or water gaining access to the lower part of the building other than damp in the foundations. (3) Rain water beating against the walls of the buildings. (4) Faulty or negligent construction whereby water penetrates the walls. (5) Sweating of the walls.

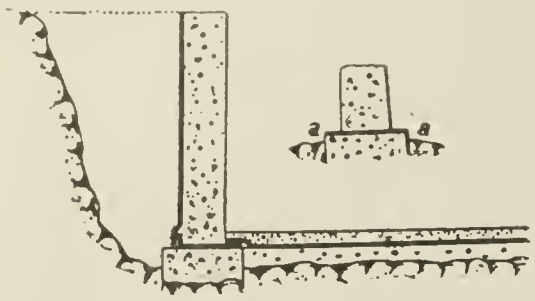


Fig. 1—Impermeable Sheeting.

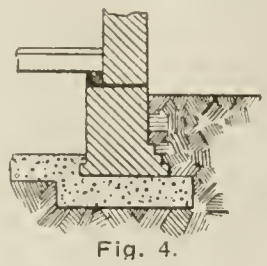


Fig. 4.

The ground both inside and around the structure should be made damp-proof and all access of surface water should be cut off. The walls should be built in such a manner that rain cannot be driven into them so as to reach the inside faces. A cavity wall is often superior to a solid one in this respect.

The entrance of water through openings in the walls

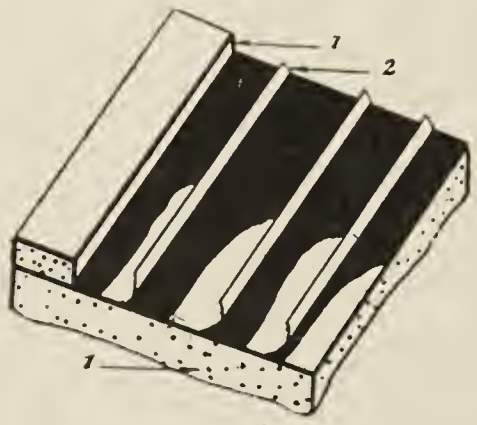


Fig. 2.

1. Concrete.
2. Layers of felt. Black: lac or bitumen.

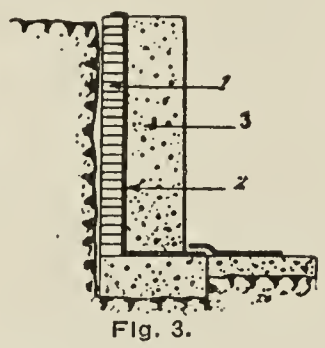


Fig. 3.

1. Wall of light bricks.
2. Impermeable sheeting.
3. Concrete foundation wall.

or at the eaves is chiefly the result of defective workmanship, but may usually be remedied by suitable treatment.

The sweating of the walls on the inside of the structure is due to sudden changes in the internal and external temperatures, whereby warm, moist air is brought into contact with the cold concrete and condensation occurs. This may be prevented by interposing a protective material whose temperature is intermediate between that of the warm air and the cold wall, or by building the walls in such a manner that the temperature of the air in internal surface has no relation to that of their outer surface. Hollow blocks are recommended.

To prevent the unpleasant effects of dampness it is desirable to:

Apply superficial coats, such as paints, plaster or substances of a membranous nature to the damp portion.

To apply an integral method in which water or damp-proofing material is added to the concrete while the latter is being mixed and before the walls are built. The material may be added in solution or it may be mixed dry with the cement. The liquid agents are supposed to be uniformly mixed with the material, but the dry and finely powdered agent is usually the more convenient.

The possible action of the water-proofing agent on the reinforcement and on the concrete proper should also be ascertained at various temperatures so as to avoid corrosion. The following proportions are suggested where dampness or water is to be combated.

For 4 parts of crushed stones, ¼ to ½ in. diameter, a mixture of 1 part of cement and 2 parts of sand containing rather more fine grains than are needed to obtain a concrete of maximum strength.

For smaller stone (½ in. and less) a 1:1:2 mixture will give better results than a 1:2:4 concrete. Recent investigations have shown that natural gravel stone gives a more impervious concrete than one made with crushed stone.

For mortars for recovering facades a mixture of 1 part of cement to 3 parts of sand is excellent, while a 1:2 mixture is equally suitable for foundations.

Concrete is made more damp-proof by the addition of hydrated lime to each 100 lb. of cement used.

The use of coatings and plasters protects concrete against both dampness and water in large quantities and their decay is by no means rapid. They may be applied advantageously to surfaces above ground level or to the interior of tanks and other containers. They usually consist of solutions of soap and alum, coatings of tar or paraffin; cement slurry containing a waterproofing agent and applied in a series of layers.

Another group of superficial protecting agents includes elastic materials such as tar, asphalt, etc., which are applied hot, and sheets of felt. To be effective such materials must completely cover the surfaces to be protected, especially at the joints. When the pressure of a liquid is to be resisted, alternate layers of felt (either coated with tar or not) and of asphalt, or preparations with tar base, are used, the number of coats varying from local conditions, one to six coats being applied. See Figs. 1 and 2. A ¼-in. coat of mortar cement 1:2 may be applied as a finish. This method of waterproofing is preferably applied during the construction of the building.

In waterproofing foundations, a bed of impervious material should be laid to form the base, on which is placed a sheet of tarred felt which goes beyond the wall on each side. When the wall is complete and the setting of the concrete is certain, the sheet is folded up against the wall and attached by means of asphalt

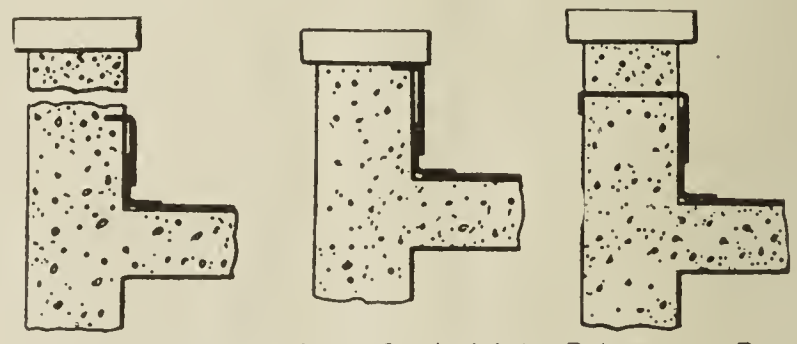


Fig. 5—Methods of Making Good Joints Between a Balcony Projecting Wall or Chimney and Roof.

or tar. The outer side of the wall is then tarred from above downwards, and special care is taken to make good joints. In Fig. 1 sufficient space is left on both sides of the wall to enable the workmen to move about readily and to facilitate the application of the sheets. Where there is less space the arrangement shown in Fig. 3 may be used, the work being commenced by building a wall of brickwork, lining this on the inside with impermeable sheeting and then placing the concrete close to the latter.

When there is no cellar it is desirable to place sheet lead, bitumen or other composition between the walls of the foundations and those of the building proper to act as a damp course (see Fig. 4). It is necessary to ventilate the space between the foundation and the ground floor by means of protected openings in the foundations.

The following experiment is instructive: If one edge of a sheet of blotting paper is dipped in water the latter will raise up the paper, and if the latter is in contact it will soon be saturated. If a sheet of the same paper is wet and placed in a closed vessel with another (dry) sheet of blotting paper near to but not touching it, the dry sheet will be quickly dampened by the moisture from the first sheet. If, however, a current of air is allowed to circulate freely in the vessel the wet sheet will dry rapidly without the dry sheet being affected. A similar phenomenon is observed in buildings. Thus, if two parts of a solid wall are connected by a porous joint, any moisture in one part will be transmitted to the other through the joint. If two walls are separated by a closed space filled with stagnant air the moisture will tend to pass from one to the other, but if the cavity is properly ventilated the interior wall will remain dry. This does not mean that a system of ventilation is essential, but that the enclosed air must be sufficient to absorb and to retain all the moisture under all conditions.

When metal or other ties which are likely to be damaged by moisture are employed they should be covered with a plaster in order to preserve them.

Continuous wall-cavities are liable, in case of fire, to prove very dangerous, as they act as flues and increase the distance traveled by the flames. For this reason and because they are primarily used to prevent damp interiors such cavities should be broken into smaller ones, not open to the atmosphere.

When concrete paints are used as waterproofing agents it is imperative that the concrete should be quite dry. The various preparations of this character each have their special advantages—some preserve the outer surfaces of the concrete or prevent efflorescence. Others preserve the interior surfaces of the building. In either case all cracks should be filled before the paint is applied.

A roof is waterproofed in the same manner as any other part of a building. If it is of concrete a good waterproofing agent such as tar, felt and asphalt, may be applied to either the apex or lower surface. The joints between the wall and certain other parts of the building such as chimney, skylights, etc., or between the latter and the roof should be made with special care. Figure 5 shows three methods of making a good joint between a balcony projecting wall or chimney and the roof.

If dampness penetrates through the space between window or door frames and the walls, attention should be paid to such spaces, and if one of the applications previously mentioned is made with sufficient care it will usually prevent any further trouble.

Agricultural Lime in 1918

The lime manufactured for agricultural use in the United States in 1918 amounted to 391,047 short tons, valued at $2,698,848, according to figures submitted by the producers to the United States geological survey, department of the interior. The raw limestone pulverized and sold for land dressing amounted to 1,091,918 short tons, valued at $1,626,292. Compared with 1917, these figures represent a decrease of 20 per cent in quantity of lime and an increase of 5 per cent in quantity of limestone used in agriculture.

Paraffin Method of Making Silo Walls Air Tight

Silos made of concrete, brick, or other material of porous or semiporous nature are benefited by an inside coating of a preparation which seals the pores and also prevents the action of silage juices on the walls. The coating most commonly used hitherto is coal tar thinned with gasoline and applied with a paint brush. A number of materials of like nature have been considered for this work, but the one showing the most promise is paraffin, states the Reclamation Record.

Paraffin may be applied either cold or hot to silo walls. With the cold method the paraffin is dissolved in a volatile carrier like naphtha until a saturated solution is obtained. Four pounds of paraffin dissolved in one-half gallon of gasoline or naphtha will make one gallon of this solution. The solution is then applied much like paint to the surface of the concrete, which it penetrates according to dryness and porosity. One gallon has a covering capacity of about 200 square feet.

The naphtha soon evaporates, leaving the paraffin in the holes. When applying the paraffin by this method, special care must be taken that there is good ventilation in the silo and that there are no lights or fires nearby. Naphtha is very inflammable, and a serious explosion or fire may result from careless use.

Paraffin may also be applied in melted form. It requires 6½ pounds of paraffin to make one gallon of the hot paraffin solution. The work should be done on a warm day, and the concrete must also be sufficiently warmed by artificial heat so that the paraffin may be thoroughly rubbed in. One gallon will cover about 250 square feet of surface. When this method is followed, a blowtorch should be used to warm the walls as the paraffin is being applied and also to thin and spread the layer of paraffin. Two buckets of paraffin should be used, one to be heating while the other is being applied. The hot-paraffin treatment is one of the most successful for water-proofing surfaces exposed to weather, but it requires some experience to obtain successful results.

Effect of Sea Water on Reinforced Concrete Structures

The Society of German Portland Cement Manufacturers, in collaboration with the Material Testing Bureau at Lichterfelde and the Hydraulic Works Inspection Department at Husum, on the island of Sylt, have been experimenting for about 20 years in order to discover the most suitable mixture for concrete for sea-water structures. In this connection Dr. Gary has recently published a detailed report in a communication of the Material Testing Bureau, the conclusions of which are given as follows in Mitteilungen des Reichsbundes Deutscher Technik.

In order to obtain suitably strong structures in sea water, it is necessary to use cement which is as rich as possible in silicates, but poor in kaolin and iron oxide. Such cements, when at the same time they are rich in lime, can be considerably increased in value by adding certain quantities of trass. The decisive factor, however, for the permanence of concrete structures in the sea is the use of mixtures which are as dense as possible and impervious to sea water, while at the same time sufficient external hardening should be given to the substances before they are placed in the sea by exposing them to heat and to moist air. Concrete, the mortar of which contains more than 66⅔ per cent of sand, will generally not show the necessary density to enable it to stand attacks by sea water for any length of time.

Flood Prevention by Use of a Concrete Spillway Wall

By D. W. McGrath & Sons, Columbus, Ohio

The flood of 1913 at Columbus, Ohio, is probably well remembered by most people. At that time the waters of the Scioto River flooded over portions of the city causing a great calamity. The property loss was estimated at $5,000,000, and action was immediately taken to prevent another such flood which if it came again might cause greater damage and loss of life.

Showing Concrete Spillway Wall at Columbus, Ohio.

One of these flood prevention measures was the straightening and widening of the river through the city of Columbus. The river winds through the low alluvial plain. The channel has sufficient cross section to allow for the passage of all waters when the stage of the river is normal. However, Spring and Winter freshets had caused many disastrous floods.

One of the very interesting and important structures being built to prevent a reoccurence of a flood and its consequent calamity is the great concrete Spillway Wall. This wall is very clearly shown in the accompanying illustration. The wall has been spoken of as a "safety valve." It has a length of 1,200 feet, a height of from 25 to 33 feet and a base width of 21 feet. The entire structure is supported by wooden piles. It is expected that the river during extreme floods will overflow this 1,200 foot crest formed by the reinforced concrete cantilever retaining wall. In this way this overflow will thus be spread over a wide area thereby preventing a volume and velocity which would have disastrous effects on a part of the city if such a wall was not constructed.

The construction is being carried in back of the old level. The sand is loaded into bins either from the cars or the stock pile. The material bins are on the river side of the wall. Batch cars on narrow gauge tracks pulled by a Ford Locomotive are placed under the bins for loading and hauled to the traveling concrete plant. The plant can be seen in the background on the river side of the wall and consists of a Boss concrete mixer lower boom and chutes mounted on a portable foundation.

A-1:2:4 concrete is used with 7-per cent by weight of hydrated lime. Successful use is being made of steel forms. The forms are rapidly placed and the finished concrete is of good appearance when the forms are removed.

New Radial Type Loader for the Rapid and Economical Loading of Loose Materials

In recent years the increasing use of sand, gravel, crushed stone, ashes, slag, etc., for road building, concrete work, and other purposes, as well as the increased storage of coal and coke, has caused the handling and re-handling of immense quantities of loose materials.

During the time that help was plentiful and cheap, the prevailing method was to use a gang of laborers to shovel materials from ground storage to wagons or trucks. However, the constantly increasing cost and acute shortage of labor demanded the substitution of mechanical handling machinery to replace the old expensive and laborious "hand shovel" method.

To meet this demand the Jeffrey Self-Propelling Loader was brought out about 10 years ago, after extensive experiments and tests and careful study of the then existing conditions, being the first machine of its kind to be placed on the market, and has proved a remarkable labor saver and quick handler of materials.

It has been used with great success by hundreds of leading concerns, but in order to meet developments in the various industries and the constantly changing conditions, the Jeffrey Company has developed an improved design known as the Radial Loader, which overcomes all the objections of the old type of machine, and is the last word in design and construction.

Self Feeding Into Pile.

There is a great advantage in having the loader feed itself into the pile over other methods of hand shoveling or using a special mechanical device to pull Loader was its inability to feed into the pile.

Showing the small radius in which the Type K Loader will operate; a feature which enables the machine to turn in congested places or around a corner.

the materials in front of the buckets. The greatest objection to the old 4-wheel type of Self-Propelling

Three Wheel Construction.

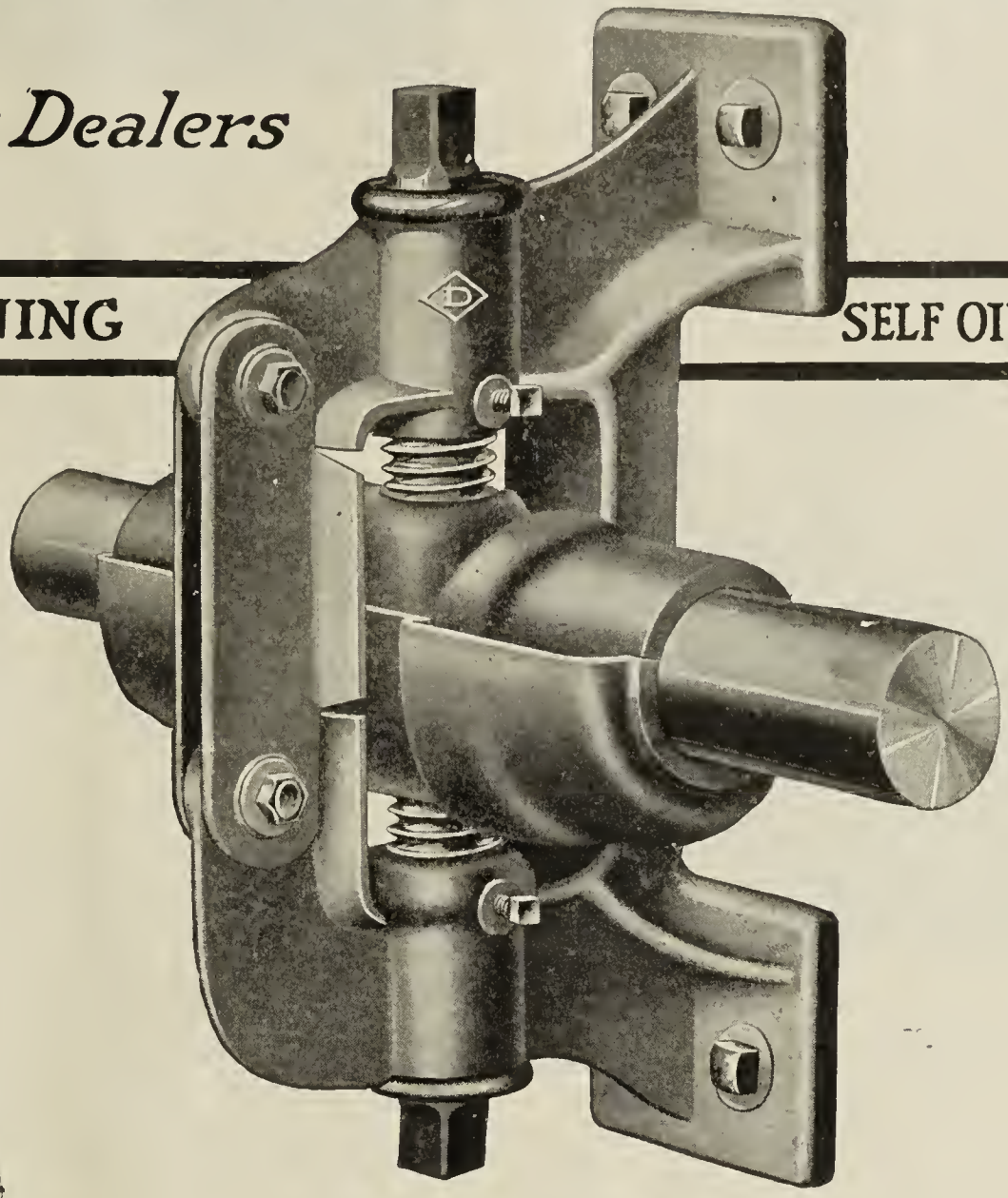
The three wheel construction of the Jeffrey Radial Loader enables it to move backward and forward along straight lines into a pile of material or to cut wide swaths across the face of a pile by swinging alternately upon its driving wheels as pivots, which action is obtained through the use in its driving unit of a set of differential gears, the same as in an automobile,

Dodge Post Hangers

ADJUSTABLE BALL AND SOCKET TYPE

Sold by Dealers

SIDE OPENING — SELF OILING BEARINGS



Dodge hangers are designed to eliminate, as far as possible, vibration and friction. They are the very foundation of a "roadbed for power." The ball and socket fitting insures alignment of the bearing with the varying motion of the shaft. The side opening makes the millwright's work easy and permits accuracy of erection.

You will find a complete stock of hanger and bearing line at your dealer's—order from him direct at a delivered price.

DODGE

Dodge Sales & Engineering Company, distributor of the products of the Dodge Manufacturing Company and the Dodge Steel Pulley Corporation. General Offices: Mishawaka, Ind. Works: Mishawaka, Ind., and Oneida, N. Y.

Canadian Plant: Dodge Mfg. Co., of Canada Ltd., Toronto and Montreal

Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark

whereby the driving wheels act in conjunction with or independently of each other.

As noted in Figure (1), by turning the steering wheel at quite an acute angle to the driving wheels, the discharge chute will remain practically stationary at the center of the circle while the pick-up end of the extending elevator boom will travel in a circular path or by alternately reversing the propelling drive, the loader will oscillate back and forth in an arc. If the steering wheel is gradually turned through a few degrees either way from the above circular path, the whole machine, while cutting from right to left in an arc, will gradually move forward into the pile, allowing full range of the machine. This illustration also shows the small radius in which the Jeffrey Radial Loader will operate.

Other Advantages of the Radial Loader.

The Radial Loader is designed to handle heavy materials such as crushed stone, sand, gravel, coal, etc.

Fig. 2. (Neg. 11400.)—Radial Loader handling material from storage pile to railroad car. The perfect swiveling chute makes it convenient to distribute material over a large area of car without moving the loader.

The large wheels enable it to pass over soft, rough or uneven ground, and it will rigidly maintain its equilibrium under all conditions of ordinary rough storage ground or floor. The quickly adjustable loading boom makes the loader an ideal clean-up machine on both smooth and rough ground. Buckets are designed for heavy service. 14" x 10" Heavy Malleable Iron Buckets with renewable Digger Edge Steel Teeth riveted on front lips and ends protect it from wear.

Two Speed Feature.

The Radial Loader has a fast speed of 60 feet per minute for traveling from pile to pile and a slow speed of 4 feet per minute for feeding into the material. Experiments have shown that a two-speed machine is absolutely essential to obtain the greatest result with the least labor.

CAPACITY OF THE RADIAL LOADER—1 cubic yard per minute. Will load crushed stone maximum size pieces through 2½-inch ring—maximum size coal 6-inch lumps.

The Radial Loader is equipped with either Electric Motor or Gasoline Engine. Skilled labor is not required for its operation and all controlling levers are in plain sight and in easy reach of the operator. The Jeffrey Manufacturing Company, 914 Fourth St., Columbus, O. will gladly send any of our readers catalogs, prices and further information concerning this loader.

Fig. 3. (Neg. 11428.)—Loading direct from Hopper Bottom Car into Motor Truck. An extra man has been placed in car to feed material through the hopper doors.

Economical Sand and Gravel Pumping

R. Snoddy, manager of the Coon River Sand Co., Des Moines, Iowa, is perhaps one of the most successful, as well as one of the most experienced operators in the Middle West. His pumps are designed by him and built at a local foundry from his own patterns. His pump casings last several seasons, instead of weeks. The reason, he says, is because these pumps are designed to handle his particular material, which by long experience he has come to know intimately. His pump is the result of practical experience, and not at all of mathematical calculation—which does not mean necessarily that mathematical and theoretical considerations would not improve it, but the fact remains that it is a very successful pump for his particular material.

Mr. Snoddy says the key to successful sand and gravel pumping is in keeping the pumped material in suspension inside the runner, instead of grinding out the casing by throwing the gritty material outward against the pump casing. Of course, this is no secret, since it is what every sand pump designer aims to accomplish. The point is that Mr. Snoddy does accomplish this end, as the life of his pumps show, while many operators under exactly similar conditions, wear out a manganese-steel pump casing in as many months as Mr. Snoddy's ordinary cast-steel casings last in years.

The moral of this little tale is not to design and build your own pumps, which may be very inconvenient, nor is it to use Mr. Snoddy's design, necessarily, since it doesn't exist in the form of working drawings, and he is not in the pump business, anyhow. Moreover, there is no assurance that his design would be best for all materials and all conditions. The real moral is to know your material and to know your pump, and be sure these same pair properly to produce a maximum amount of material at the lowest cost of operation!

The material pumped at Des Moines carries a large amount of sand in proportion to the gravel. This is undoubtedly an important factor in selecting the type of pump. One important feature of Mr. Snoddy's pump is the extreme simplicity of the design as a whole—a most desirable feature to be sought after.—[Rock Products.]

The Louisville Cement Co., Sellersburg, Ind., employed women assistants in its cement laboratory during the war because of the scarcity of available young men. The company has found them reliable and efficient workers and much more contented with their lot in life than male laboratory workers; and they are there yet.

Cement and Engineering News

Vol. 32 Chicago, April, 1920 No. 4

Keep the Cement Sacks at Work

One empty sack at the cement mill is worth any number of them lying idle in dealers' or users' hands all over the country in so far as shipment of cement is concerned. Like many other kinds of cotton goods cement sacks are scarce. If every idle cement sack in the country were returned to the plant which sent it out, there would be considerable relief of the present shortage both of cement and sacks.

Besides, cement sacks cost you money—money which is not working for you as long as you keep the sacks in your possession and thus make it impossible for the manufacturer to buy them back.

This condition is simply another one of those seemingly trifling items of neglect, that in its own way is contributing to keeping the wheels of industry from moving as regularly and as smoothly as we all would like.

If a cement plant ships 1,000,000 barrels of cement a year in sacks, 4,000,000 sacks are necessary to take care of this shipment. Under actual conditions when shipments are made every day, the cement plant at the end of a year would find itself short a very large number of sacks because dealers or cement users have not returned all they received. The following year it would, therefore, be necessary to supplement the stock of sacks by purchasing new ones. Sooner or later some sacks are certain to be lost through neglect or because put to improper use and thereby permanently kept from being again used as cement containers. No one knows exactly what becomes of them, but if lost while in your possession, it means money lost to you.

Many building and highway contractors have shown commendable enterprise in purchasing and storing during the past winter, large quantities of cement in anticipation of immediate need when the construction season opens. Naturally, this has temporarily prevented the circulation of many cloth sacks. Nevertheless there are enough empty sacks in users' and dealers' possession throughout the country, which, if returned to the cement mills, would make the number held out of circulation through storage of cement relatively insignificant.

Remember cloth cement sacks represent an outlay of money by you until you have returned them for credit, and if they are not returned promptly, that the cement manufacturer must provide for new containers to take care of his business with you. This represents an unnecessary waste because far more containers must be manufactured and used than would actually be necessary if every cement sack was kept at work.

Take care of cement sacks.

Keep them at work.

Return them promptly so the cement manufacturer can ship the cement you want.

Plenty of Cement and No Increase in Prices

Cement is becoming more and more a factor in construction work each succeeding year. It is one of the few materials that has not advanced greatly in price. There probably will be a bigger demand for it this year than ever before. Lately, because of car shortage, the movement of cement from the kilns has been checked. This has led short sighted persons to buy wildly. There is no shortage. There is and will be plenty of cement to go around unless construction people, in their folly, figuratively fall over each other in their efforts to obtain cement and then overstock themselves and cut off the supplies of others.

Do not let anyone tell you there is a shortage of cement. There is not. The car trouble will be adjusted in time. There should be no increase in price. The cement makers do not want any increase. They have done very well by the public and they mean to continue doing so. They are wise. They are following the course that means a great broadening of their business.

Dynamite as a Public Servant

Neither general contractors nor building contractors use dynamite as often as they might and by so doing, effecting considerable saving of time, labor and money.

For example, take the case of a Philadelphia contractor who was employed by a new owner, to remodel the buildings and alter and improve the grounds of a large suburban estate near that city. He used dynamite in the following fifteen distinct and separate operations:

Two hundred fruit and ornamental trees were found to be in poor condition. Small charges of dynamite in the soil around them broke up hardpan, aerated it, and improved the drainage.

Earth was loosened and blasted out for a swimming pool. Saving by blasting estimated at $150.00 on a $1,600.00 item.

Holes in which to plant a number of young trees and transplant a large number of shrubs, hedges and fruit, evergreen and ornamental trees were blasted at an estimated cost of 25%.

Earth loosened and thrown out of cesspools and post holes. Cost about the same as hand labor, but work finished in two weeks less time.

Stumps of live and dead trees that were cut out were blasted for just about half what it would have cost to dig them out.

Dynamite saved from ten to thirty per cent of cost and at least four weeks time, also much hard work, on breaking up concrete floors, pavements, gutters, copings and stone masonry walls partly under and partly above ground.

It was used in aerating the hard packed soil of an

old sour lawn and vegetable garden. This was done by putting down bore holes ten or twelve feet apart, in squares, setting off a quarter pound eharge in eaeh hole. This work eould have been done in no other way, so no eomparison ean be made of cost, time, ete.

A small drainage ditch was blasted at a great saving of time and labor, but at about the same eost as for hand work.

Of the fifteen items enumerated above the average contractor would never think of using dynamite on at least half of them; some wouldn't employ it on any of them. It really behooves eontraetors to give this powerful assistant their eonsideration. It can be made a mueh more useful publie servant if more of its logical users would make it their business to understand it better.

Insurance Given to Employes

An insuranee policy for the sum of five hundred dollars ($500.00) will be given entirely without cost to every employe of the Westinghouse Eleetrie & Manufaeturing Company who has been in the serviee of the Company for a period of six months or more, aecording to a statement made by one of the offieials of the Company. The plan is effective Mareh 1.

In addition, the employes, after April 1, may inerease the value of their polieies to amounts varying from $1,000 to $2,000, depending upon the length of serviee and continuity of savings.

All employes who have been in the Company's service for six months or longer and who deposit a sum eaeh pay day in the Employes' Savings Fund, equal to 2% or more of their earnings, will not only receive 4½% interest eompounded semi-annually on such deposits, but, in addition, will automatically have their insurance increased to amounts up to $2,000, depending on the length of time they have been with the Company.

For example, a man who has been in the service of the Company for at least 15 years and has regularly deposited in the Employes' Savings Fund 2% or more of his salary, on which he regularly reeeives 4½% compound interest, is presented with an insuranee policy in one of the established Companies for the sum of $2,000, at no cost whatever to him.

After an employe has maintained the required deposits for a period of five years he may discontinue or withdraw his deposits from the Savings Fund without in way affecting the value of his insurance policy.

In order to provide for cases where employes need some money and do not wish to disturb their savings and thus affeet the value of their insuranee poliey, loans will be made by the Company to the extent of 90% of the amount to the credit of the employe in the Savings Fund without in any way affeeting the value of the insuranee.

This insuranee is to be made effeetive at all of the various offiees and plants of the Westinghouse Electric Company and will affeet approximately 50,000 people.

Byers Chicago Office

The John F. Byers Machine Company, Ravenna, Ohio, announces the opening of their new Chieago District offiee, 20 West Jackson Blvd., Chicago, in charge of Mr. E. L. Kelzer, in order to render meehanical and sales service to their growing elientele on Byers "Auto-Cranes" and Hoisting Engines.

Push Use of Cement Stave Silo

A $5,000 advertising campaign to inerease the popularity of the eement stave silo in Iowa is to be earried out. The Iowa Concrete Silo Assoeiation at its annual meeting in Des Moines reeently worked out a standard for cement silos. The plan of the assoeiation members is to insist upon a eertain standard, and the association will then underwrite the guarantees made by the individual members. The plan is intended to bring forcibly home to the mind of the farmer that he is taking no risk when he buys a cement silo.

Harvey S. Owen Appointed Chief Engineer Glencoe Lime Co.

The National Lime Assoeiation announces the resignation of Harvey S. Owen, formerly Western Distriet Engineer of the Lime Asoeiation. Mr. Owen has been doing excellent work in the States of Wisconsin, Miehigan, Indiana, Illinois, Missouri, and other adjacent states, toward having hydrated lime specified in conneetion with large and important eonerete ctruetures.

The best wishes of the assoeiation go with Mr. Owen in his new affiliation, that of ehief engineer of the Gleneoe Lime and Cement Co., St. Louis, Mo.

Mr. Owen has had a rather varied experienee sinee graduating from the Missouri Sehool of Mines in 1910, and his qualifieations fit him for his new work. His experience since 1910 eonsists of a year as State Chemist of the State of Missouri. From 1910 to 1917 he spent in eonstruetion work in various eapaeities, most of the time being spent with the St. Louis Board of Public Works.

In 1917 Mr. Owen beeame assoeiated as engineer with the Portland Cement Assoeiation, his duties embraeing a teehnieal study of eoncrete and sales promotion work as applied to the various uses of eement and cement poduets. In January, 1919, he beeame assoeiated with the Lime Assoeiation as Western Distriet Engineer, the duties of whieh position caused him to make a thorough technical study of lime and lime products and sales promotion work as applied to the construction uses of lime. This work also gave him eonsiderable superfieial knowledge as to the chemistry and manufaeture of lime and lime produets.

He is a member of the following engineering organizations:

American Soeiety of Civil Engineers.
Ameriean Association of Engineers.
Ameriean Soeiety for Testing Materials.
Ameriean Soeiety of Municipal Improvements.
American Road Builders' Asociation.
St. Louis Engineers' Club.
Missouri Highway Engineers' Assoeiation.
Ameriean Concrete Institute.

Correction

Referring to the deseriptive article in the February issue of CEMENT & ENGINEERING NEWS regarding the Southwestern Portland Cement plant, it was stated that the votary kiln in this plant was furnished by Vulean Iron Works, whieh is a mistake. The kiln was furnished by Allis-Chalmers Manufaeturing Company, who also furnished this plant with two 350-horsepower slip ring type motors.

Future of the American Cement Industry

Interview With Stephen B. Mambert, President of the Edison Portland Cement Co., by a Representative of the Merchant Marine Supplement of the New York Herald—Eulogy of Thomas A. Edison

The future of the cement industry, particularly with reference to exports of cement from this country, is rather difficult to prophesy. We can get some idea of the possibilities, however, if we review the past situation and note the tendencies of export trade since the war. Of course, a large number of different conditions will have a bearing on the subject.

Before the world war (in 1913) the greatest exporter of cement was Germany. Her exports to the various countries of the world totaled 6,500,000 bbls., and nearly one-third of this amount went to Argentina, Brazil, Chili and otrer South American countries. Since 1913 Germany's total exports of cement have dropped to nearly one-third of her pre-war total, practically all of which has been going to Holland.

The cement exports of Belgium in 1913 nearly equaled those of Germany. About one-half went to Argentina, Brazil and other South American countries. But Belgium's cement industry has become prostrate. When the Germans found it necessary to evacuate Belgium they followed the deliberate policy of so crippling the industries as to make competition impossible for years. It is said that metallurgists, mill operators and trained experts were sent from Germany to direct the looting and complete the destruction, so that the mills would have to be rebuilt from their very foundations.

The United Kingdom formerly exported 3,500,000 bbls., not quite three-fifths of the amount shipped by either Germany or Belgium. The war had the effect of cutting England's cement exports in half.

With the chief competitors of the United States in the cement trade temporarily prostrated industrially, this country occupies such an advantageous position that the exportation of cement becomes one of the opportunities of peace. Latest reports along this line show that not only are the gains in cement exports made by the United States during the war being retained, but they have increased in this first post-war year.

Rapid Growth of Industry

Scarcely any other industry has developed with such phenomenal rapidity in recent years as has that of cement. It is used in hundreds of ways never dreamed of fifty years ago, there being now one thousand definite uses for cement. The growing demand and number of uses have speeded up production until in 1917 the United States' output was nearly 95,000,000 bbls. (of 380 lbs. each, the basis of all calculations here given). This is almost equivalent to one barrel used per inhabitant of the country. Compare this with the production of 2,000,000 bbls. in 1880 and 17,000,000 bbls. in 1900.

Cement competes successfully with brick and stone for durable construction, and with lumber for quick construction. It has replaced wooden sidewalks entirely, and competes with iron and clay for sewer pipe. Unlike common brick, whose chief consumption is in the large cities, cement has won a large market in the farming states for use in silos, barns, bridges, culverts, dams and aqueducts, and has also gained a foothold in shipbuilding. In the United States it shows a five-fold increase in per capita consumption between 1895 and 1916, while lumber and brick consumption has decreased 40 per cent.

Edison's Contribution to the Industry

The improved methods that have been introduced by Thomas A. Edison into the manufacture of cement have gone a long way toward reducing the cost and making it the universal building material.

Starting right at the quarry where the stone is mined, picture the old method of operation which was to drill and blast down small quantities of stone, reducing each stone to a size that could easily be handled by man, and the shoveling, loading and lifting of each piece by men to the cars. The necessity of reducing the stone to such small size at the quarry required great quantities of explosives and materially restricted the production, while maintaining a high cost. Edison first introduced steam shovels which replaced these expensive methods. Single hundred-thousand-ton blasts make posible a great decrease in labor and dynamite costs.

This method of quarrying the rock was followed by Edison's improved method of crushing. Pursuing the principle that there is a greater economy in rotary than in reciprocating machinery, as exemplified in the electric motor and the steam turbine, Edison developed revolving rolls, which reduced rock from 10 tons to ½ in. in size, at considerably less cost than reducing the same rock by means of explosives at the quarry.

Again, Edison invented and gave to the industry rotary kilns of double the capacity formerly obtained, saving a ton of coal to every 60 bbls. of cement produced.

The condition in which American shipments of cement reached foreign ports, on account of the breakage of cement barrels, was another problem. In the usual form of packing, the cement is dumped in a barrel and quickly sealed. The handling in loading and unloading on truck, train, lighter and ship, as well as the vibration of the ship's machinery, causes the cement in the barrels to settle, leaving an air space at the top. This leaves part of the barrel unsupported by its contents and therefore more easily breakable. The Edison process permits of packing in such a way that no air space is left in the barrels. The method consists in imitating the ship's motion in shaking the barrel so as to concentrate the contents and eliminate the air while being packed—then filling up the barrel; repeating the process until the barrel receives its maximum quantity. The solid contents give no opportunity for air space to form in transit to and from the ship and while on shipboard, and the contents always carry the package rather than the package carrying the contents.

The price of cement has reacted more slowly to the general rise in price of commodities during the six years, and is actually less than the average percentage rise in price of all commodities for the period from 1913. In fact, according to statistics prepared by the War Industries Board, the average advance in the prices of all commodities is one-third greater than the advance in price of cement.

Export Prospects

The prospect for a rapidly increasing export trade for the United States depends, of course, upon maintaining this low price level, which, in turn, depends upon increased production, aided by large exports at

low shipping rates. It sees certain that shipping rates will be lowered rapidly to assist us in meeting foreign competition. This point has been demonstrated by the fact that to date the rates to South American points have been lowered to about one-half of the rates in effect when the armistice was signed. The importance of freight rates to the foreign consumer may be appreciated when it is understood that cement costing about $2.25 in the United States cost $9.60 (American currency) in Rio de Janeiro in November, 1918, while at the present time the cost is $5.34 in Rio.

South America is becoming one of the greatest consumers of American cement. Since the reduction of European shipments Chili, Brazil and other countries must look to the United States, Japan and possibly Canada, to supply their needs in regard to this commodity. Our shipments of cement to South American ports last year totaled 1,000,000 bbls., in spite of the war curtailment of production and shipping. The increased use of reinforced concrete to supplant stone, brick and adobe in private and public buildings, and the demand for cement for railway and other construction, all mean that the South American market will be a large one.

Argentina is the largest importer of cement in South America. In 1913 that country imported over 4,000,000 bbls., mainly from Belgium, France and England. Of this the United States shipped 60,000 bbls. By 1918 our shipments to Argentina were 200,000 bbls. per annum, an increase of 230 per cent in five years.

Cement is one of the most important articles of importation into Brazil from this country. In 1917 one-half of the imports of this commodity were from the United States. By a special privilege clause cement imported from the United States enjoys a 20 per cent tariff reduction.

While South American imports of cement from the United States have increased to 1,000,000 bbls. per annum, or 200 per cent, since 1913, her imports from England have fallen to 400,000 bbls., or 40 per cent of the former total. Nevertheless, although England is temporarily handicapped, she will continue to be one of this country's chief competitors for the South American market, in view of the fact that South America previously consumed nearly one-half of England's cement exports.

Fuel Cost Determining Factor

In all these countries, as well as in the United States, the production of cement is dependent upon the coal production. Germany may be particularly handicapped by the lessened coal mining, while the cost of English cement may be abnormally high, due to this cause. American cement will be affected somewhat, but it is hoped that it will be to a more moderate degree.

Six million barrels of cement output, plus an efficient merchant marine, place Japan in virtual control of the Far Eastern markets, formerly controlled by Germany. In 1916 Japan exported to China 100,000 bbls., to British India 200,000 bbls., to Australia 80,000 bbls., and to Ceylon 40,000 bbls.

The African market is comparatively small, but growing in importance. Egypt imported 30,000 bbls. in 1913, Algeria 200,000 bbls., and British South Africa 500,000 bbls., France supplying the north and England the south of Africa.

A factor having great weight in determining the volume and flow of foreign shipments is the rate of foreign exchange. While in Asia the more favorable rates of exchange, now more favorable than formerly, may encourage our shipments to the Far East, the reverse condition exists as respects our shipments to Europe. In Europe the high conversion rates may reduce American shipments as effectively as a protective tariff against American goods.

Not only must exchange and shipping rates be stabilized, but the volume of trade must be increased, for the cement industry, similarly to all industries of a tonnage nature, is only able to manufacture its products at a minimum price when the tonnage total is at the maximum. For this reason the increasing use of cement, in raising the standard of living, is dependent upon the securing of as large a tonnage of export business as is possible. Only by securing this large tonnage will the industry as a whole be able to maintain its price scale at less than the general increase in prices taking place in all other commodities.

Whether or not America may give the world the benefit of this lower cost is dependent upon large shipments, the stabilizing of exchange and the establishment of shipping rates which will give American cement an equal change with foreign cement in foreign markets.

Products Company Will Have Branch Factories

Announcement was made at a meeting of the board of directors of the United Cement Products Company, last week, that arrangements had been completed for the establishment of branch factories in Miami and Jacksonville, Fla.; Atlanta, Ga.; Birmingham, Ala.; Houston and Ft. Worth, Texas.; Wichita, Kan.; Des Moines, Iowa; Minneapolis, Milwaukee, Cleveland, New York City, Rochester, N. Y., and Pittsburgh. The main factory and general offices of the company are to remain in Indianapolis.

The United Cement Products Company recently took over the interests of the Perfection Septic Tank Company, which has had its offices and main factory in Indianapolis during the last six years. The new company plans to expand the business, operating throughout the entire United States instead of in a limited territory, as was the policy of the old company. The officers of the new company are: Charles F. Surface, president and general manager; M. R. Hyman, vice-president and sales-manager; and Myron D. Rinker, secretary-treasurer. Aquilla Jones, John R. Clough and Charles Brossmann will serve on the board of directors. Mr. Hyman and Mr. Clough will have charge of the sales promotion and advertising departments and Mr. Brossmann will be the consulting sanitary engineer.

The Perfection Septic tank, which the United Cement Products Company will manufacture and distribute, has been in use throughout Indiana and adjacent states for a number of years. It is said to be a complete sewage disposal plant and to be adapted for residences, school houses, factories, etc.

Premixing No Benefit in Concrete

To determine the benefit of mixing cement and water for a long period (15 to 30 minutes), and then adding aggregates to produce a concrete instead of the ordinary method of mixing cement, aggregate and water together for one or two minutes, comparative tests were made last year by the United States Bureau of Standards. The strengths obtained were about the same with the same materials and conditions, indicating that there is no advantage in long premixing of cement and water.

Portland Cement in 1919

Large Increase in Production and Shipments

Preliminary estimates compiled by the United States Geological Survey, Department of the Interior, indicate that the production and shipments of Portland cement in 1919 increased 13 and 21 per cent, respectively, over those in 1918 and that the stocks decreased 52 per cent, so that at the end of 1919 less than 5,000,000 barrels of Portland cement was in stock at the mills. The Portland cement industry was set back considerably in 1918, when war restrictions reduced the shipments from the 90,703,474 barrels shipped in 1917, to 70,915,508 barrels, but it is now regaining its lost ground. Early in 1919 the business was even poorer than in 1918, and practically all the increase reported was made during the latter part of 1919, so that 1920 started with favorable prospects for the cement industry. During 1919 the shipments from some mills were limited by the lack of freight cars. The increase in the value of the cement shipped in 1919 over that shipped in 1918 was about 28 per cent.

The shipments of Portland cement in 1919 amounted to 85,485,000 barrels, valued at $144,461,000; the production amounted to 80,287,000 barrels; and the stocks at the mills at the end of the year amounted to 4,976,000 barrels.

One new plant produced Portland cement in 1919—the Indiana Portland Cement Company at Greencastle, Ind. The total number of plants that produced cement in 1919 was 110, and the total number of plants that shipped cement was 113. The average factory price per barrel for Portland cement in bulk in individual states in 1919 ranged from $1.57 in Kansas to $2.03 in Utah. The average factory price for the whole country in 1919 was $1.69, an increase of only 6 per cent over 1918.

The exports of hydraulic cement from the United States in 1919 amounted to 2,463,689 barrels, valued at $7,516,019, or about $3.05 per barrel, increases of about 9.27 and 16 per cent, respectively, over 1918.

Estimate of output of Portland cement in the United States in 1919, with actual figures for 1918, by States.

State.	Barrels, 1918	Barrels, 1919.	Percentage of change in 1919.	Average factory price per barrel in 1919.	Percentage of change in price in 1919.
California—					
Shipments	4,238,424	4,505,000	+ 6	$1.95	+17
Production	4,354,074	4,531,000	+ 4	.....	....
Stock	528,026	464,000	—12	.....	....
Illinois—					
Shipments	3,703,471	4,863,000	+31	1.62	+ 5
Production	3,594,038	4,166,000	+16	.....	....
Stock	646,255	3,000	—99	.....	....
Indiana—					
Shipments	6,205,326	7,651,000	+23	1.64	+ 6
Production	5,291,851	7,120,000	+35	.....	....
Stock	822,888	314,000	—62	.....	....
Iowa—					
Shipments	3,188,669	4,561,000	+43	1.69	+ 1
Production	3,626,455	3,661,000	+ 1	.....	....
Stock	1,055,540	81,000	—92	.....	....
Kansas—					
Shipments	2,586,834	3,083,000	+19	1.57	— 4
Production	2,499,723	2,935,000	+17	.....	....
Stock	326,273	166,000	—49	.....	....
Michigan—					
Shipments	3,618,088	4,935,000	+36	1.70	+ 1
Production	3,554,872	4,620,000	+30	.....	....
Stock	635,447	328,000	—48	.....	....
Missouri—					
Shipments	4,515,695	5,609,000	+24	1.66	+ 5
Production	4,738,596	5,157,000	+ 9	.....	....
Stock	676,552	103,000	—85	.....	....
New York—					
Shipments	4,074,159	4,274,000	+ 5	1.66	+ 3
Production	4,095,588	4,140,000	+ 1	.....	....
Stock	832,271	638,000	—23	.....	....
Ohio—					
Shipments	1,289,887	1,864,000	+45	1.74	+ 2
Production	1,440,859	1,762,000	+22	.....	....
Stock	262,142	143,000	—45	.....	....
Oklahoma—					
Shipments	1,218,841	1,405,000	+15	1.88	+ 4
Production	1,246,515	1,404,000	+13	.....	....
Stock	89,188	67,000	—25	.....	....
Pennsylvania—					
Shipments	22,238,689	26,419,000	+19	1.62	+ 7
Production	22,628,901	25,222,000	+12	.....	....
Stock	2,840,810	1,703,000	—40	.....	....
Texas—					
Shipments	1,918,919	2,288,000	+19	1.83	+ 6
Production	1,971,867	2,230,000	+13	.....	....
Stock	289,779	233,000	—20	.....	....
Utah—					
Shipments	549,593	934,000	+70	2.03	+21
Production	570,310	801,000	+40	.....	....
Stock	133,465	21,000	—84	.....	....
Washington—					
Shipments	1,116,754	1,441,000	+29	2.01	+ 6
Production	931,489	1,438,000	+54	.....	....
Stock	214,220	197,000	— 8	.....	....
Other States*—					
Shipments	10,452,159	11,653,000	+12	1.74	+ 7
Production	10,536,525	11,100,000	+ 5	.....	....
Stock	1,101,094	515,000	—53	.....	....
Total—					
Shipments	70,915,508	85,485,000	+21	1.69	+ 6
Production	71,081,663	80,287,000	+13	.....	....
Stock	10,453,950	4,976,000	—52	.....	....
District.					
Lehigh District (eastern Pennsylvania and New Jersey)—					
Shipments	19,351,123	23,630,000	+22	1.63	+ 7
Production	19,701,820	22,614,000	+15	.....	....
Stock	2,512,123	1,546,000	—39	.....	....
New York State—					
Shipments	4,074,159	4,274,000	+ 5	1.66	+ 3
Production	4,095,588	4,140,000	+ 1	.....	....
Stock	832,271	638,000	—23	.....	....
Ohio and western Pennsylvania—					
Shipments	6,231,702	7,164,000	+15	1.63	+ 6
Production	6,439,179	6,726,000	+ 5	.....	....
Michigan and northeastern Indiana—					
Shipments	4,183,260	5,421,000	+30	1.70	+ 2
Production	4,106,467	4,990,000	+22	.....	....
Stock	790,495	372,000	—53	.....	....
Southern Indiana and Kentucky—					
Shipments	1,960,109	2,644,000	+36	1.65	+ 2
Production	1,609,475	2,455,000	+50	.....	....
Stock	246,242	55,000	—69	.....	....
Illinois and northwestern Indiana—					
Shipments	7,894,542	9,884,000	+25	1.62	+ 6
Production	7,169,038	8,945,000	+25	.....	....
Stock	1,088,775	218,000	—80	.....	....
Maryland, Virginia, and West Virginia—					
Shipments	2,308,193	2,628,000	+39	1.73	+ 7
Production	2,281,629	2,462,000	+ 8	.....	....
Stock	268,384	108,000	—60	.....	....
Tennessee, Alabama, and Georgia—					
Shipments	3,092,425	2,780,000	—10	1.69	+11
Production	2,990,734	2,727,000	— 9	.....	....
Stock	118,988	69,000	—42	.....	....
Iowa, Missouri, and Minnesota—					
Shipments	8,712,597	11,575,000	+33	1.67	+ 2
Production	9,478,051	10,102,000	+ 7	.....	....
Stock	1,937,902	267,000	—86	.....	....
Nebraska†, Kansas, Oklahoma, and central Texas—					
Shipments	5,365,848	6,387,000	+19	1.70	+ 1
Production	5,370,181	6,184,000	+15	.....	....
Stock	654,876	419,000	—15	.....	....
Rocky Mountain States (Colorado, Utah, Montana, and western Texas)—					
Shipments	2,175,874	2,972,000	+37	2.00	+ 8
Production	2,288,953	2,772,000	+21	.....	....
Stock	375,042	213,000	—43	.....	....
Pacific Coast States (California, Washington, and Oregon)—					
Shipments	5,565,676	6,126,000	+10	1.98	+14
Production	5,550,548	6,170,000	+11	.....	....
Stock	783,479	696,000	—11	.....	....
Total—					
Shipments	70,915,508	85,485,000	+21	1.69	+ 6
Production	71,081,663	80,287,000	+13	.....	....
Stock	10,453,950	4,976,000	—52	.....	....

†No output in 1918.

*1919: Alabama, Colorado, Georgia, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oregon, Tennessee, Virginia, West Virginia. 1918: Same states except Nebraska

Jefferey's Los Angeles Office

In order to look after their rapidly growing business in California, Arizona, Nevada and the State of Sonora, Mexico, the Jeffrey Manufacturing Company of Columbus, Ohio, have opened a new branch office in Los Angeles, California.

This office will be in charge of Mr. F. R. Field, who has been Manager of their Denver Office. Mr. Field is well and favorably known in this territory, and his many years of successful salesmanship and a thorough personal knowledge of the west and the requirements of its buyers, especially fit him to take care of the contantly increasing demand for Jeffrey Products in his vicinity, and render valuable assistance to clients in solving their Elevating, Conveying, Crushing and Mining Machinery problems.

Effect of Rodding Concrete

In a letter to the editor in the January 8 issue of the Canadian Engineer, Mr. F. E. Giesecke, professor of Architectural Engineering, University of Texas, gives some interesting and valuable information as to the effect of "rodding" concrete. Abstracts from his letter follow:

For some time the Engineering Division of the Bureau of Economic Geology and Technology of the University of Texas has been devoting considerable attention to an investigation relating to improvement in concrete construction and based on the following assumptions:

(a) The strength of concrete is a function of the cement-concrete ratio, other factors remaining constant.

(b) For a given set of conditions there is a fairly

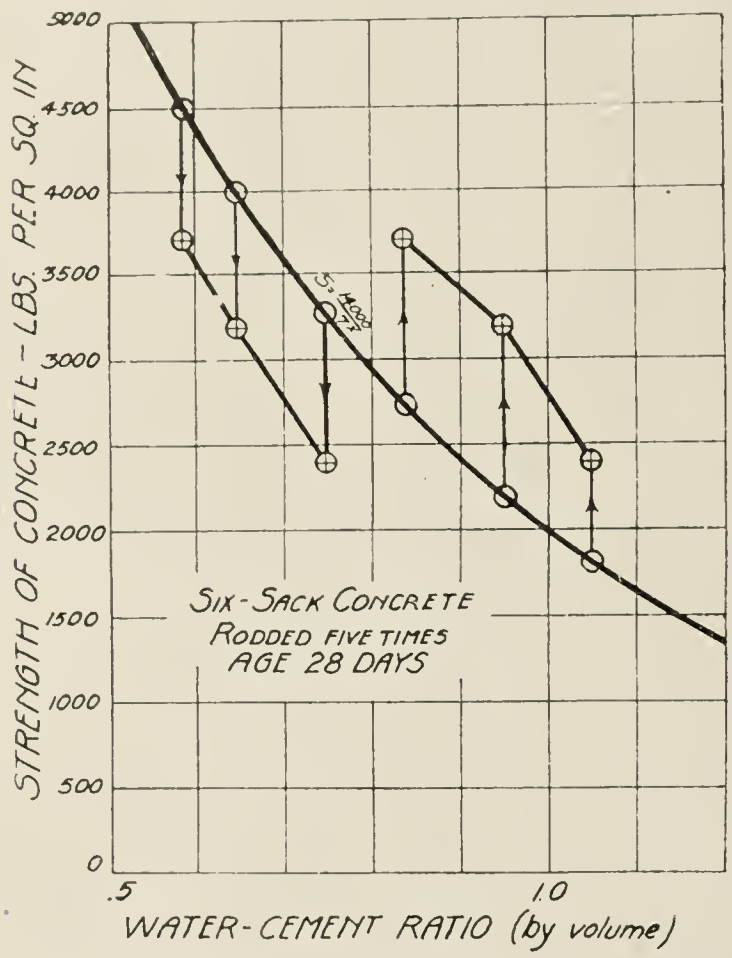


Fig. 1—Comparison of Prof. Abrams' Curve with Strengths of Rodded Concrete. Water-Cement Ratios Based on Quantity of Water in Concrete Before and After Rodding.

definite water-concrete ratio which assures the greatest strength of the concrete.

(c) In practical concrete construction it is generally necessary or at least often highly desirable to use more mixing water than the optimum quantity, in order to produce a concrete which is sufficiently fluid to be handled advantageously and which will flow readily into the forms and between and around the reinforcing steel—even though such concrete is weaker than it would be if less water had been used in its preparation.

During the course of our experiments it was found that it was possible to prepare concrete with considerably more than the optimum quantity of water, deposit this concrete in the molds in a manner similar to that used in actual concrete construction, then "rod" the concrete, and finally secure a material which is fully as strong as it would have been had only the optimum quantity of water been used.

In other words, by this method of producing concrete it is possible to secure the advantage of economic handling and thorough filling of forms and coating of reinforcing steel, which is characteristic of concrete containing excess mixing water, and also the advantage of maximum strength, which is characteristic of concrete prepared with the optimum quantity of mixing water.

During the course of our investigation Prof. Abrams published his discovery that the strength of concrete can be expressed as a function of the water-cement ratio; the compressive strength of a 28-day concrete, prepared of good materials, being approximately $14{,}000/7^x$ lb. per square inch.

Prof. Abrams' value was accepted as the best available basis for the comparison of the strength of rodded and unrodded concrete because Prof. Abrams had made a sufficient number of tests to convince us of the accuracy of his work, and because those of our tests which were made with unrodded concrete agreed well with Prof. Abrams' results.

Since the strengths of our rodded concrete were so much in excess of those shown by Prof. Abrams' curve, it was suggested that we repeat our tests and determine the quantity of water expelled from the concrete by the rodding, and to plot the strength against the water remaining in the concrete to see whether Prof. Abrams' expression would then agree with our results.

This was done in connection with a series of tests designed primarily to determine how the strength of "rodded" concrete varies with the cement-concrete ratio and with the maximum size of the coarse aggregate, other factors remaining constant.

The cement-concrete ratio is expressed in terms of the number of sacks of cement incorporated in a cubic yard of concrete; the six-sack concrete, for example, refers to concrete which, in its final condition, contains cement at the rate of six sacks of 94 lbs. of cement per cubic yard of concrete.

In a series referred to, three cement-concrete ratios, namely, 4-sack, 6-sack, and 8-sack; three maximum sizes of the coarse aggregate, namely, ½ in., 1¼ in., and 2½ in.; and four water-concrete ratios; six specimens were made of each kind, or 216 specimens in all, were used.

The results of the 28-day tests of the 6-sack, 1¼ in. maximum size aggregate, are shown in Fig. 1 for three water-cement ratios; it appears from this figure that, for this particular concrete, the values shown by Prof.

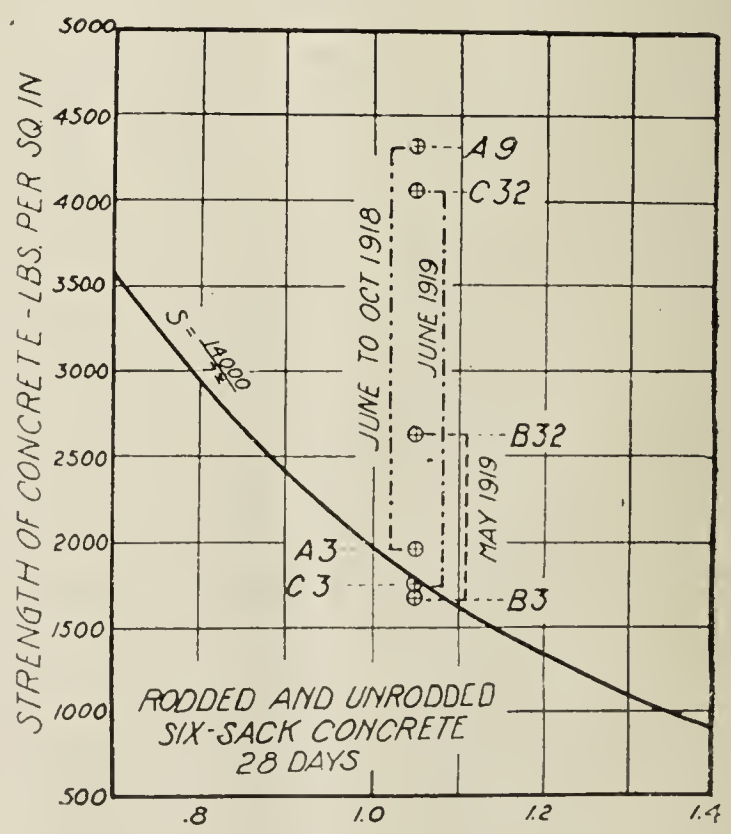


Fig. 2—Comparison of Strengths of Unrodded and Rodded Concrete with Each Other and with Prof. Abrams' Curve.

Abrams' curve are about 28 per cent too low when the water-cement ratio is based on the quantity of water used in mixing the concrete, and about 26 per cent too

high when the ratio is based on the quantity of water remaining in the concrete after rodding.

Our 28-day results for the 4-sack and 8-sack concretes are very similar to those for the 6-sack shown here.

Figure 2 shows Prof. Abrams' curve and the results of three parallel groups of tests of rodded and unrodded concrete made by us. The average strength of our nine unrodded specimens made at three different times, widely separated, is 1,811 lbs. and falls almost exactly on Prof. Abrams' curve; this shows that our materials and methods must be very similar to those employed by Prof. Abrams.

Since our results with unrodded concrete agreed with Prof. Abrams' curve near the middle of that curve and for that type of concrete which is most generally used in reinforced concrete work, and since Prof. Abrams concluded from his extensive tests that "it is seen that for given concrete materials the strength depends on only one factor—the ratio of water to cement," I see no reason for a further checking of Prof. Abrams' curve.

Group A of Fig. 2 consists of three unrodded and nine rodded specimens; these results were obtained June to October, 1918.

Group B consists of three unrodded and 32 rodded specimens; these results were obtained in June, 1919. and have not yet been published.

Group C consists of three unrodded and 32 rodded specimens; these results were abtained in June, 1919.

The reason why the strengths of the Group B rodded specimens are so much lower than those of Group C is that in the case of Group B the water which was worked out of the specimens by rodding was allowed to remain on the specimens so that the same were practically standing under water, whereas, with Group C, concrete was added as the rodding compacted the specimens, so that the molds were practically full of concrete and the water which was rodded out of the specimens could run off over the tops of the molds, our molds being practically water-tight.

Sand and Gravel News

Announcement is made by the Greenville Gravel Company, of Greenville, Ohio, of a new policy, which is of more than passing interest.

This company operates eleven sand and gravel washing, screening and crushing plants in five states, having an aggregate capacity of ten million tons a year, and it operates and maintains a department known as the Greenville Mfg. Company, equipped with a modern factory and an engineering department.

The company states that in late years it has been frequently solicited by other producers and by other persons investing in enterprises similar to the gravel industry for engineering suggestions and assistance. This practice finally became so common that the company determined to augment its present engineering department so as to enable it to more fully accommodate its friends in this particular.

To that end, the company announces that it is prepared to share with the public its seventeen years successful gravel plant operation and expensive experimental work by placing at the disposal of the public all the services of its engineering department. After January 1, 1920, it offers to furnish experienced engineers to inspect prospective plant sites, design and equip plants and furnish erection supervision.

The Superior Sand & Gravel Company, Chas. H. Brodt, manager, Detroit, Mich., heartily endorses action taken at Indianapolis by the Board of Directors of the National Builders' Supply Association in regard to raising funds by taxing total sales, (one-tenth of one per cent on last year's total net building supply sales to be levied for the support of the National Association during the present year), and are urging every member of the association who has not already obligated himself to come forward now.

Progress in Use of Shafting and Bearings

By S. A. Ellicson, Treasurer and General Manager Chicago Pulley and Shafting Co.

S. A. Ellicson

In the early '90's line shafts were driven by one unit of power and power was transmitted to all parts of the factory either by rope or belt drives. The majority of hangers used at that time were of the babbitted wick-oiling type. Ring-oiling hangers were looked upon as a luxury, but from experience it was found that one unit of power transmitting power all through a large factory was an expensive way on account of the large loss of friction, varying from one-third of the total horsepower used to as high as 60 per cent where shafting became out of alignment and babbitted boxes were badly worn.

The owners of factories began to look around to see where they might save a part of this friction loss. Motors came into use more and more. Smaller shafting was used and smaller units of power. They also began to buy better bearings. Where they formerly used wick-oiling bearings, they began to use babbitted ring-oiling bearings, and today a large majority are changing to roller and ball bearings to save as much as possible of the friction load.

Roll bearings will save 33 per cent of the friction load and ball bearings about 80 per cent which, with the high cost of material, is worth saving. Eighty per cent of the friction load is equal to between 20 and 25 per cent of the total power used; besides, it is a large saving on the upkeep and there is no dripping of oil on the floor, which insures a clean factory.

As far as line shafting is concerned, my observation is that the owners of factories are looking for the best they can buy, no matter what the first costs are, adopting the slogan that the best is none too good.

F. C. Austin Company Increases Manufacturing Facilities

The F. C. Austin Machinery Co. is organized to take over the entire business of the F. C. Austin Company, Inc., the Municipal Engineering and Contracting Co., and the Muskegon plant of the Linderman Steel and Machine Co. It retains the personnel of both companies, whose combined efforts will be directed towards supplying the demand for the Austin lines of machinery.

The combination of Austin and Linderman plants

increases eight fold the capacity of the Austin output in the past, which gives this new company, without a doubt, the largest capacity for the manufacture of earth loading and cement working machinery in the United States.

Mr. F. C. Austin retires from the active management, and the president of the Linderman Company, Mr. B. A. Linderman, assumes full control.

The offices of the company will be maintained in the Railway Exchange Building, Chicago.

The Modern Cement Mill of the Western States Company

The Western States Portland Cement Company of Independence, Kansas, whose plant is illustrated on this page, have made an enviable reputation for enterprise and good management. They operate three 9 by 175-ft. rotary kilns with a total daily capacity of 350,-bbls. In the quarry two deep well drills are used for the blast holes and the stripping and loading is done with a steam shovel, the material being hauled to the crushing plant by locomotives. There the installation consists of one 84 by 60-in. jaw crusher and one No. 9 Williams "Jumbo" mill. The material then has its moisture reduced in four 5½ by 60-ft. rotary dryers and passes to a raw grinding department equipped with four No. 8 ball mills and eight 5½ by 22-ft. Allis-Chalmers tube mills. The mills are of the Vulcan type, gas fired. The finishing is done by means of six No. 8 ball mills and twelve 5½ by 22-ft. tube mills. Operating economies have been effected largely by means of co-operation between the company and its employes, in which Mr. Charles M. Loveland, the superintendent, has shown a great deal of tact and good judgment.

This plant contains eight Jones spur gear speed reducers. The rotary kilns and other mills are operated by individual motors through Jones reduction gears, which give uninterrupted satisfactory service. They are not only dust proof, but they insure a maximum delivery power at a speed as uniform and positive as that of the driving motor, and they economize space to such an extent that they can be placed where other forms of drive would be out of the question.

F. L. Smidth & Company, Engineers, 50 Church Street, New York, N. Y., designed and built this cement mill, which has had a steady substantial growth and is one of the most prosperous of any in the country.

The Western States Portland Cement Company has recently started drilling operations on rock bearing land near Buffalo, Iowa, in Scott County, a short distance from Davenport. Upon the result of these drill tests will depend the decision of the company to build a new cement plant on this site. Mr. A. D. Stancliff and H. J Robertson, officials of the company are on the ground personally directing operations. The Sullivan Machinery Company of Chicago has been given the contract to make the borings in thirty different places. These holes will be sunk to a depth of from 80 to 200 feet. It is reported the new plant will cost about $2,000,000.

The Western States Portland Cement Plant

A Cement Manufacturer Denies that Prices Are Unreasonable

The Good Roads movement in Illinois has been abandoned on account of high prices. Governor Lowden, in his investigation of a year ago, came to the conclusion that cement was being held up close to the profiteer line, and Frank I. Bennett, director of public works, believes that if we had a state cement plant we could produce cement for a little over a dollar a barrel. A cement plant would cost about $3,000,000.

The cement manufacturers have their side in connection with the Good Roads controversy and Mr. A. Y. Gowen, vice-president of the Lehigh Portland Cement Company, writes as follows:

"Last year the State of Illinois purchased from the various cement manufacturers in this territory approximately 1,900,000 barrels of cement, of which amount our company was allotted 305,000 barrels for shipment during the years of 1919 and 1920 for the construction of permanent roads in this state. Of the 305,000 barrels we were allotted by the state last year, they took only 67,000 barrels, leaving a balance of 238,000 barrels carried over and to be shipped during 1920, and I understand the total amount of cement carried over last year by all of the cement manufacturers, including ourselves, amounted to approximately 1,500,000 barrels, or sufficient to build somewhat in excess of 350 miles of roads this year, and I believe that contracts were awarded last year for the construction of this work.

"About a month or so ago the State of Illinois purchased from the cement manufacturers in this territory an additional 1,800,000 barrels of cement for the con-

struction of about 450 miles of new roads to be built during the year 1920, and of this amount our company secured an order for 250,000 barrels.

"In summing up the above figures you will note the State of Illinois has now purchased, and the cement manufacturers have agreed to deliver, somewhat in excess of 3,000,000 barrels of cement during the year 1920, or sufficient cement to construct over 800 miles of permanent roads.

"I feel it would also be of interest to you to know that our company, realizing the importance of the construction of these roads, has at all times given preference to shipments to the State of Illinois, and we stand ready to ship the cement which the state may desire if we are able to secure sufficient equipment from the railroads to move this product.

"The second question, and one which is, in my opinion, equally important, is the price which the state has agreed to pay the manufacturers for their cement. The price at which the state purchased the cement for last year was on the basis of $1.75 per barrel at the mill, and the price which they are to pay for the cement purchased this year is on a basis of $1.85 per barrel at the mill, which represents a maximum advance of less than 6 per cent. This increase represents the only advance which we have made since May, 1917, during which time our cost of production has increased in excess of 30 per cent.

"To substantiate further the moderate advance in cement prices we gladly refer you to the present prevailing prices on other materials, and would especially call your attention to the Engineering News Record, giving prices in the city of Chicago proper on a few building materials, together with the increase by percentage, as compared with the increase in the price of cement.

(Here Mr. Gowen presents a table citing an increase of 50 per cent in the price of brick since 1917, of 67 per cent on southern pine, of 52 per cent on yellow pine, and of only 4.7 per cent on cement.)

"I thought that you might also be interested in knowing that from 1913 to 1919 inclusive our company has made less than 10 per cent on its invested capital, and for the past two years, namely 1918 and 1919, our net return has been less than 7 per cent on our invested capital, and I believe that any fair-minded group of business men would admit that in a manufacturing business in these chaotic times this return on the invested capital is and has been entirely inadequate."

News of the Crushed Stone Quarries

Testing of new motors and machinery installed by the Linwood Stone & Cement company's plant near Davenport, Iowa, last week. The company expects to make the "turnover" from the old machinery to the new plant within a week, probably by April 15th.

The company's production will be increased 600 per cent by the new machinery. The maximum production, however, will not be attained for several months.

The plant with the new machinery represents an investment of $200,000.

Employes of the Linwood Stone & Cement company are paid a monthly bonus based upon plant production and company earnings, according to a statement made by J. F. Schroeder, secretary and treasurer of the concern.

The company claims the honor of being one of the pioneers in the field of profit sharing systems. The system was inaugurated on Jan. 1.

The men in the plant are paid 5 cents for every yard of saleable stone taken from the quarry. The bonus is apportioned among the men according to the number of hours employed. The bonus amounts to from $1 to $2 a day, Mr. Schroeder said, and is paid every month.

The men employed in the office receive 5 per cent on the company's net earnings.

E. C. Roberts has sold the Harriman Cement and Stone Company, Bowling Green, Ky., to Gillis Roberts, who will continue the business on a more extensive scale than heretofore.

Mr. G. W. Roberts will manufacture road material and contract for concrete construction work and other activities in this direction. Mr. Roberts is a practical man in this line of business, having completed large contracts in Anderson county, Tenn., and elsewhere.

The question of cars has been taken up with railroad officials by A. P. Sandles, secretary of the National Agricultural Limestone Association. There is a marked shortage of cars for this industry, and since fertilizer manufacturers are being given preference in the distribution of cars, it is believed that manufacturers of agricultural limestone, which comes in the same class, should be given like preference.

A meeting of officials of the National Crushed Stone Association and of the National Sand and Gravel Association was held at Indianapolis, Ind., recently, and was attended by A. P. Sandles, secretary of the National Crushed Stone Association, and P. C. Hodges, of the Marble Cliff Quarries Co., of Columbus. The representatives of the National Sand and Gravel Association were Secretary A. Sutton and his assistant, H. S. Natkemper, of Terre Haute, Ind. Steps were taken to secure data to be presented to government rate making authorities showing that the advance in rates on crushed stone and similar products has been greater than any other commodity and if another freight rate advance is necessary, the crushed stone and sand and gravel men have had theirs, and should not be made to suffer any more. The data will be secured on blanks soon to be distributed among the crushed stone manufacturers. The Ohio Macadam Association is co-operating with the national association in this movement.

The Bound Brook Crushed Stone Co., of Bound Brook, N. J., has just blasted down 150,000 tons of the hardest kind of basalt (trap rock), using in the shot 11 tons, 1,250 lbs. of dynamite, in the following proportions: 17,250 lbs. of 50 per cent L. F. Extra, 4 by 8 in., 4,000 lbs. of 50 per cent L. F. Extra, 1½ by 8 in., 2,000 lbs. of 50 per cent Gel., 1½ by 8 in.

In preparing for the blast two tunnels were cut on a level with the quarry floor; the larger tunnel of the two was driven in at right angles with the quarry face to a depth of 35 ft., then a drift was cut each way at

right angles with the main entrance, or parallel with the quarry face; the main tunnel was 145 ft. long. There were 17 drifts from this main tunnel, averaging 15 ft. each in length. In the end of these drifts the dynamite was loaded in various quantities.

The second and smaller tunnel which was shot at the same time, was cut in a distance of 20 ft. from the face of the quarry, then branched at right angles to right and left, the same as the larger tunnel, making the straight tunnel 98 ft. long. From this there were five drifts—all on the same side, to an average depth of 9 ft. towards the quarry face—making a total in all of about 535 ft. of 4 x 4 ft. tunnel in the project.

"Cordeau-Bickford" detonating fuse was looped into each pocket of the explosive, as it was loaded, forming a circuit in each of the four main branches of the two tunnels; the two ends of each of the four loops of fuse were brought out to the mouth of the tunnels.

After the tunnels were packed full of stone sand, C. V. Higgins, local manager of the company, discovered that by attaching the two ends of each loop of fuse to a galvanometer it could be indicated that there had been no breakage in the fuse, which shows that "Cordeau-Bickford" fuse can be tested as easily as an electric wire. After testing the four loops, the ends were all connected together and one No. 6 electric exploder was attached, which did the trick.

This quarry is located on the New Jersey Central R. R. The stone is used for concrete, all kinds of road work and railroad ballast. This rock shows a crushing strength of 42,500 lbs. per sq. in. The tunneling and loading was supervised by the company's own men, with the assistance of the Atlas Powder Company's representatives. William J. Scott, demonstrator, was in charge of the work for the Atlas Co. After the tunnels were built they were surveyed by a local engineer, to ascertain the thickness of the walls and amount of burden to be lifted.

While the loose stone is coming out the drill overhead is working through the upper surface and the men with the Jackhammer drills are at work on the locating. Everything goes on with clock-like regularity and not a moment is lost in "clearing off" as in the old style method of bench drilling. The use of the muckers is also eliminated.

The total elevation over that of the floor level at the highest point is 98.5 ft., the lowest point being 78 ft. As heretofore stated, the tunnel is 32 ft. high, therefore the only loss in any instance is 66.5 of 5¾-in. hole that is not now utilized. However, the results are so much more favorable in every way that this loss is greatly overbalanced.

The cost of removing the stone by Mr. Comly's method has been no more than the ordinary outside blast and substantially less than any tunneling done in the Atlas quarry. Without doubt this method of blasting will be employed wherever practical throughout the country, as soon as the success by its use becomes generally known.

Mr. Comly leaves Hannibal with the best of recommendations from the officials of the plant.

With a view of supplying the demand for crushed limestone as a fertilizer, the branch quarry of the Carthage Marble and White Lime company, Carthage, Mo., has been purchased by the Carthage Crushed Limestone Company, and the installation of a 400-ton limestone crusher has been started. The new plant will have a storage capacity of 15 carloads. The extensive use of crushed limestone in making concrete is also anticipated, when the road making and street paving contracts are started the coming spring. The new industry will employ about twenty-five extra men in quarry work. Gates No. 5 and No. 3 gyratory crushers are installed in this plant.

E. T. Comly, general limestone quarry foreman of the Atlas Portland Cement Co.'s plant at Hannibal, Mo., has resigned his position after a record of over 7 years' service with the company. He will go to Texas, where he has accepted a position similar to the one he has just relinquished.

It is stated that during Mr. Comly's connection with the Atlas people at Hannibal, he originated a new method of blasting which was used under his guidance in what is known as tunnel No. 3 in the quarry. He was given permission to proceed along whatever lines he chose to use, with the confidence born of 20 years of authentic working knowledge, perfected this system, and has proven beyond any question that tunneling through stone can be done at a far less cost than heretofore. When completed the tunnel will be 300 ft. long, 36 ft. wide, and 32 ft. high.

Using a crew averaging but 12 men on a 10 hr. a day working basis, and a steam shovel, the tunnel has gone a distance of approximately 14 ft. in 25 days.

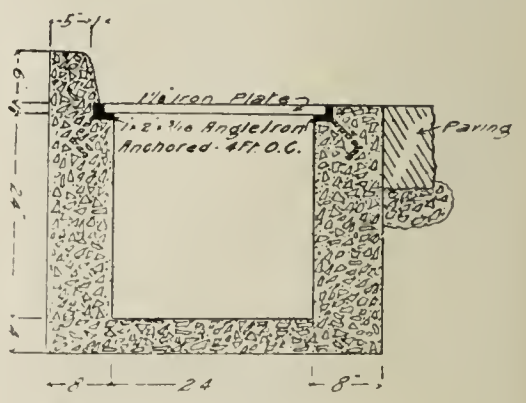
The method of blasting Mr. Comly conceived was using a well drill, 4¾-in. holes were put down at intervals of 12 ft. back from the face of the stone. These holes were drilled completely through the upper surface down to the floor level, three holes being drilled one at either side and one in the middle, making practically 18 ft. between holes crosswise.

With the aid of Jackhammer drills, two men locate these holes at the roof of the tunnel cutting off the body of the stone to be blasted out from the main body itself and the shots are placed. It can be readily seen that a single shot brings down about 54 cu. yds. The shovel is then put to work removing the loose stone.

Combined Sewer and Gutter

In planning a storm-water sewer in a street of West Orange, N. J., to discharge into a brook and extend for a distance of 500 feet therefrom, it was found that a house sewer in the center of the street, a water main on one side and gas main on the other, with their house connections, made it impossible to lay a storm sewer in the usual manner without placing it below the level of flood water in the brook.

To meet this condition, town engineer Chas. A. Winston designed and built a combined curb gutter which cost $5.55 per lineal foot and has been in satisfactory operation for several months.



COMBINED CURB, GUTTER AND SEWER.

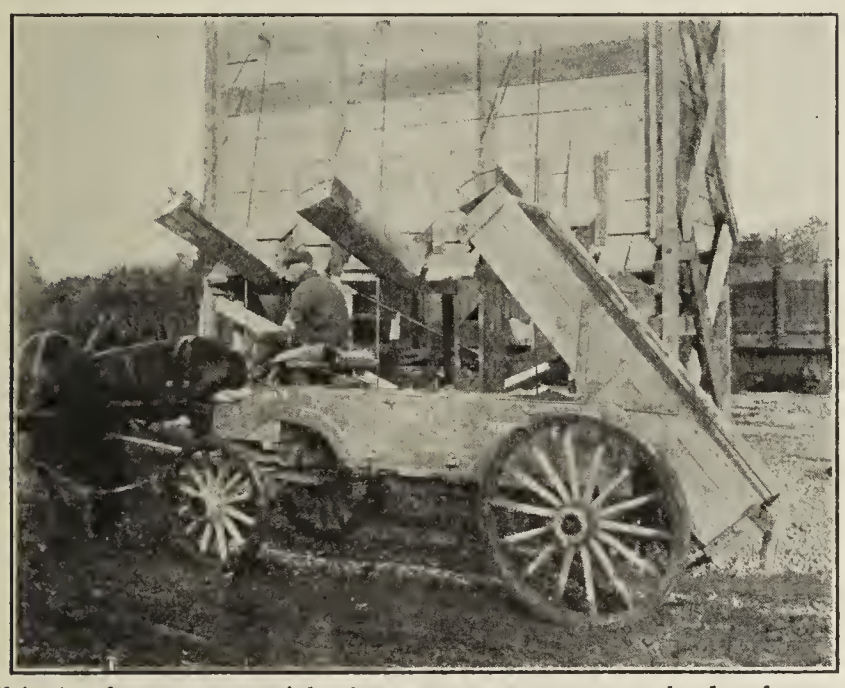
The structure consists of a channel under the gutter 24 inches wide and deep with concrete walks 8 inches thick and a concrete bottom 4 inches thick. One side is continued to the sidewalk level and serves as a curb. The channel is covered with an iron plate 1⅛ inches thick, which rests on 1x2x3/16 angle irons set into the sides of the channel; this plate being flush with the roadway pavement and serving as the gutter. The outside bottom of this channel is just about level with the tops of the gas main and water main and is 18 inches above the sewer.

Doing Away With the Shovel Gang on Road Jobs

Describing Ingenious Methods Used by Griff Construction Company, Erie, Pa., in Unloading and Hauling Materials

At no time has it been so necessary for the contractor to study his job to make every possible saving in labor as at present. The high wages demanded, uncertainty of supply and the inefficiency of labor at the present time make the labor cost perhaps the most important of the job. Never before has it been possible to make such large savings on the cost of the job by the use of plant or machinery to take the place of labor.

In building construction the old-time hoist tower and distribution of concrete by wheelbarrows or concrete carts is giving way to the chuting process. The chuting plant costs more in the beginning but the main point is that labor is saved. Larger and more elaborate devices are used for handling gravel, stone and cement. In every possible way machinery is displacing labor. So also the concrete road contractor finds that it pays to make every possible effort to supplant labor by machinery. His greatest labor expense is perhaps the handling of his stone and sand from the point he receives it to the mixer.



This is the wagon with the two-compartment body that carries exact amount of aggregates from the bins to the mixer

Perhaps in the old days it paid to have a gang shovel material from the cars into the wagons that hauled it to the job and to shovel it from the ground into wheelbarrows and then dump it into the Boss mixer hopper. It was a comparatively crude method at least five per cent of the aggregate was lost in handling and it was practically impossible to get it all off the sub-grade without getting some of the sub-grade into the Boss mixer; a frequent cause of friction with the inspector on the job.

Steam Crane With Bucket Unloading Materials into the Loading Bins

The Griff Construction Company of Erie, Penn., was confronted by this problem in the construction of a concrete highway for the state of Pennsylvania, near Northeast.

Here is how they tackled it. Delivery was by rail. A Byers steam crane with clam shell bucket, unloaded the cars either directly into the two loading bins for the wagons or temporarily piled it alongside. The crane being self-propelling, could move back and forth and fill the bins either from the cars or else pick up the sand and stone from the ground to put it into the bins.

But the most ingenious feature was the type of wagons used for hauling the aggregate from the bins to the mixer. An ordinary bottom dump cart formed the basis of this rig. On this was placed a substantial box or in reality a second body, pivoted exactly in the middle and dumping at the end.

At the bins the lower part was filled first, the upper box being tipped back to allow the chutes from the bins to dump directly. Into this part went twelve cubic feet of stone and eight feet of sand. When the bottom was filled, the upper body was hooked down and fiilled with the same amount of material or two batches for the mixer.

The finished product—after the Griff Construction Co. had Completed Their Work

At the job the wagon backed up to the mixer and the upper box dumped directly into the hopper. The load in the wagon at the same time was dumped into a steel plate on the ground from which it was easily shovelled into the charging hopper for the next batch.

Careful timing of the wagons prevented waiting at the mixer and there was no time lost.

Acceleration of Hardening of Concrete by Steam

Experiments were made during the past year by the U. S. Bureau of Standards to determine how strong a 1:2:4 concrete could be produced in 48 hours, using steam applied internally and externally to the mass of concrete. Twelve-inch cubes of concrete were subjected to the following methods of curing: Indoor air, external steam, steam flowing through embedded. perforated pipes, steam flowing through nonperforated pipes. Use of perforated pipes proved impractical, due to clogging of the ipes. All three methods of steam curing, according to the recently issued annual report of the Director of the Bureau, gave practically the same strength at the end of 48 hours. This strength was from 200 to 400 per cent of the strength of air cured concrete of the same age, depending upon whether cured indoors or outdoors, and was about equal to the strength of air-cured concrete 7 days old.

Saving Time and Labor on Road Construction

As Practiced by Charles F. Fry Construction Co.,
Erie, Pa.

The high cost and scarcity of labor and the keen competition in contract awards have made it imperative to develop labor saving and cost cutting methods for executing concrete road work.

That the best contracting firms in the country are entering the road construction field is shown by an examination of a list of State Highway awards.

It is now a recognized fact that the big problem of a road job is handling the materials. This is the factor that may result in either profit or loss. The Charles F. Fry Construction Company of Erie, Penn., has found great economy in the use of motor trucks divided into compartments. It used this type of truck on its Pennsylvania State Highway contract, west of Erie. The truck is divided into five compartments as shown in View 1. The sides and front of the box are raised to the same height as the top of the dividing partitions. This prevents the sand running over the sides of the body or into the next compartment, when the body is raised for dumping. The dividing partitions are hung on pivots located at the top of the sides of the body.

View 1. Showing five-compartment motor truck body used by Charles F. Fry Construction Co., of Erie, Pa.

The truck is used in the following way. The sand and gravel is unloaded from the gondola cars by a crane and clam shell bucket. The crane deposits the material in either storage piles or directly into large timber bins. This layout is shown in View 2. The bins are equipped with trap dors in the bottom and the materials run into measuring hoppers. Each hopper has a capacity of eight cubic feet of sand and twelve cubic feet of gravel—sufficient material for a 4-bag batch of 1:2:3 concrete. There is sufficient overhead clearance under the bins and hoppers for the truck to stand. A full batch of sand and gravel is deposited into each compartment of the truck. The original idea was to add the cement requirements at this point also. This was not found practicable however, because at times the sand and gravel contained some moisture which caused the cement to take its initial set before arriving at the mixer. Accordingly thereafter the cement was added at the mixer.

In operation the truck is run out on the grade, backed up to the mixer skip and the first compartment tripped and dumped into the skip. The four bags of cement are added. It is then necessary to drive the truck ahead a few feet to allow clearance for raising and dumping the skip into the mixer drum. The truck is delayed about eight or ten minutes at the mixer while the four batches are mixed. The fifth and last batch is then dumped and the truck returns for another load.

View 3 shows to good advantage the clean and orderly appearance of the sub-grade. The truck is shown dumping into the mixer skip. Compare these conditions with the old "sand and gravel on the subgrade, wheelbarrows and about twenty men to shovel and wheel."

View 2. Crane unloading materials from cars into storage bins which in turn delivers load to truck

There is an actual saving of five per cent of sand and gravel which was formerly trodden into the subgrade and wasted. This 5 per cent saving is a large item in itself regardless of figuring saving in labor.

The compartment motor truck has proven its worth as a cost cutter, has also eliminated the mixing of subgrade and aggregate and, therefore, a concrete of greater strength and longer wearing qualities is obtained.

Appliances which reduce operating costs and increase operating efficiency should be considered for concrete road construction. There is in prospect an unlimited amount of this class of construction and, of course, it will take initiative and inventive skill to keep abreast of the times.

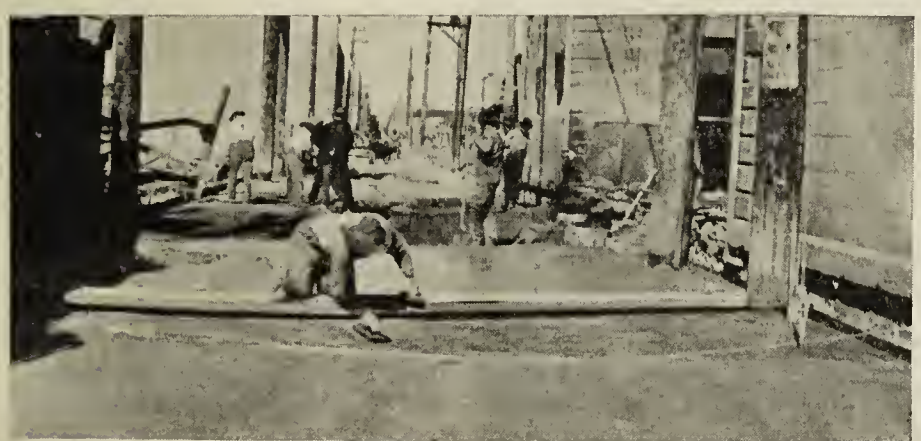
View 3. "On the Job"—Showing the Clean and Orderly Appearance of the Sub-grade Truck Dumping Materials

Concrete Alley Pavement, Twin Falls, Idaho

During the fall of 1918, Twin Falls, Idaho, laid 4,167 square yards of concrete alley pavement. This represented the first pavement of the kind to be built in Twin Falls as well as in that section of Idaho. Construction was under the supervision of E. V. Berg, City Engineer, and was done by Charles Helmar, a Twin Falls contractor.

The pavement was 20 feet wide, 6 inches thick, and dished in the center, the inverted crown being 3 inches. The mixture used was 1:1¾:3½. Three-eighths inch joints were spaced at intervals of 40 feet. These were installed in the usual manner, the filler being placed by a wooden bulkhead until a sufficient amount of concrete had been placed to hold the filler, when the bulkhead was removed. To provide transverse expansion, the area of existing structures along alleys was painted with several coats of tar to a height equal to the thickness of the pavement. The concrete was not reinforced.

A feature of the construction was the screening and finishing of the surface. Due to the fact that buildings abutted both sides of the alleys, it was impossible in many places to strike off the surface in the usual manner, so three parallel strips of wood, the tops of



Finishing Concrete Alley Pavement With Float

which were set to the proposed surface of the pavement were placed directly upon the subgrade and held in place by iron pins. One strip was placed along the center line and the other two put a foot inside of the outer edges. With an ordinary straight-edge a little longer than half the width of the pavement, the ends of which were supported on one outside strip and the middle one, one-half of the concrete was easily struck to grade. The other side was then struck off in the same manner. The wood strips were subsequently removed by the finisher operating from a bridge. This bridge was supported by driving ¾-inch round iron U-bars into the subgrade at three or four foot intervals along both sides. Planks laid longitudinally on these U-bars formed the supports of the bridge. Concrete was placed irrespective of these bars, which were removed after the concrete had partly hardened. The holes thus left were filled with grout.

After the surface had been struck off two or three times, it was rolled with a light sheet iron roller in a direction parallel to the center line, so as not to disturb the crown. Because it was impossible to use a belt for finishing, ordinary wood hand floats were used.

They Will Help to Keep Your Town Clean

Encourage the Erection of Concrete Street Waste Paper Receptacles

Every town should take pride in local welfare conditions and always keep on the alert for permanent improvements which will materially improve the town's general appearance.

One of those improvements which aid in keeping a town clean is the concrete waste-paper receptacle seen in the accompanying illustration, which shows a plain concrete exterior finish with colored tile inserts set flush with the outside face.

By arranging to insert a brass plate showing his name and address on the waste-paper receptacle that he erects the contractor can secure some free advertising. In fact, in some cases, it might pay the contractor to erect a few of these waste-paper receptacles and present them to his local municipality free of cost. This may lead to his receiving contracts for big and profitable jobs and surely gives him worth while publicity.

How They Are Constructed

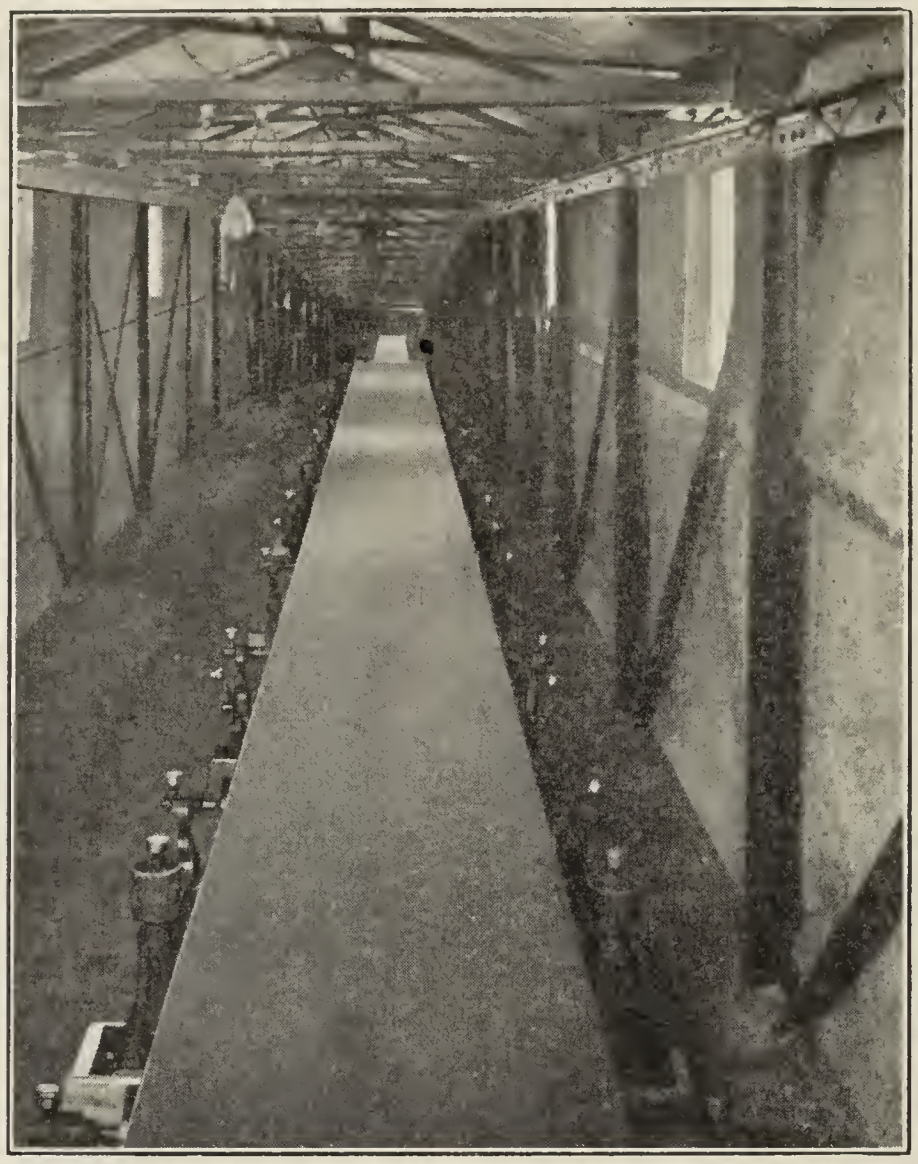
These concrete waste-paper holders may be built

View 3—Showing Plain Finish Waste-Paper Receptacle

during the cold weather in the contractors' material shed where all concreting materials may be heated and where the receptacles can be stored and cured for several days. They are reinforced with wire mesh placed in the center of the three-inch walls and floor. The concrete mixture consists of one-part of cement, two-parts of sand and three-parts of crushed stone or pebbles. Holes are provided near the bottom for draining out all the rain water.

It will pay you to promote construction of these concrete waste-paper receptacles by your town officials. The resulting orders will mean more winter work thereby keeping your plant and men employed during the slack season.

TRADE SAWYER MARK
REGISTERED



The Belts that Resist Grit

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

SUL-PHURUS

HANDLING abrasive materials in brick, clay and cement plants is a severe test of any conveyor or elevator belt. The service given by Sawyer and Sul-phurus Stitched Canvas Belts on this class of work for years is proof of their quality.

One of our representatives will be glad to co-operate with you in determining the right belt for each of your conveyor or elevator needs.

The Belts that Resist Grit

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

News of the Cement Mills

A new factor just entering the realm of the cement manufacturers is the Federal Portland Cement Co., with quarries and plant at Rutland, Iowa, and offices at Fort Dodge, Iowa. The construction of the plant is under way and will be ready for operation the early part of next year. The officers of the company are Robert Healy, president, Fort Dodge, Iowa; Edw. J. Dalton, vice-president, treasurer and general manager, La Salle, Ill., and H. E. Treleven, secretary, Fort Dodge, Iowa.

J. Andy Bard, formerly with the Marquette Cement Co., La Salle, Ill., in the capacity of assistant chemist, has taken a position with the Illinois State Highway commission under the direction of the engineering department of the state. Bard will report at the State Capitol and later will be sent to one of the eight cement companies having contracts with the state for cement to be used in the construction of highways.

From 1913 to 1919 inclusive our company has made less than 10 per cent on its invested capital, writes Mr. A. Y. Gowan, vice-president of the Lehigh Portland Cement Company, and for the past two years, namely 1918 and 1919, our net return has been less than 7 per cent on our invested capital, and I believe that any fair-minded group of business men would admit that in a manufacturing business in these chaotic times this return on the invested capital is and has been entirely inadequate.

The price at which the state of Illinois purchased cement of us for good roads last year was on the basis of $1.75 per barrel at the mill, and the price which they are to pay for the cement purchased this year is on a basis of $1.85 per barrel at the mill, which represents a maximum advance of less than 6 per cent. This increase represents the only advance which we have made since May, 1917, during which time our cost of production has increased in excess of 30 per cent.

Considerable electric machinery and operating equipment valued at $100,000, was destroyed recently at the plant of the Penn-Allen Cement Co. The fire was caused by overloading of the roof of the power plant with ice and snow, under which the structure gave way.

Nebraska is now producing a high grade of cement according to Louis J. Hoenig, sales manager of the Nebraska Cement Company, Superior, Neb., who recently attended the meetings of the Nebraska Road Institute, Lincoln, Neb. During the last three years the company has spent approximately one and a half million dollars improving this plant, and it is now capable of producing 3,000 barrels of cement per day. This has not been possible heretofore on account of the car shortage, as the product piled up in the mill faster than it could be shipped out.

Mr. Hoenig stated that the supplies of limestone and shale were practically unlimited, and that since the introduction of the wet process of milling the cement produced is of a very good quality. In answer to the question of a member as to the possibility of getting cement to finish hard surface roads, he said the output had been and probably would be this year, limited by the car shortage.

Both mills of the Lehigh Portland Cement Company, at Mitchell, Ind., are running now and the output would be greater if cars could be procured for shipping the cement. As a tangible evidence of prosperity, the company has just erected a 24-stall garage for the use of employees who come to work in automobiles.

The Western States cement plant at Independence, Kansas, went on an eight-hour basis the latter part of February. The plant has been on a ten-hour basis for some time.

J. B. John, vice-president and general manager of the Newaygo Portland Cement Co., Newaygo, Mich., is now occupying a similar position with the Petoskey Portland Cement Co., whose plant is being constructed three miles from Petoskey, Mich. Mr. John will continue his duties with the Newaygo company.

E. C. Switzer, formerly superintendent of the Wabash Portland Cement Co.'s plant at Stroh, Ind., is now superintendent for the Petoskey Co.

Charles Smith, a plant foreman for the Wabash Portland Cement Co., has been made superintendent, succeeding E. C. Switzer, who has left the company.

The 400 striking employees of the Hawkeye Portland Cement Co., of Des Moines, Iowa, who walked out recently, have not as yet reached settlement of their wage demands. A committee called upon officers of the company in an effort to reach an agreement but were refused an audience, they say.

The men are asking for an increase of 7½ cents an hour over the present scale, which received a 2½ cent boost the first of March. The average wages are from 40 to 55 cents an hour with a few blacksmiths receiving 62½ cents. Three-fourths of the men receive less than 50 cents an hour they claim.

The men complain they are often compelled to work 36 hours at a stretch with only time off for meals and no extra pay for overtime.

The men have organized and applied to the Federation of Labor for a charter. The company has refused, they say, to participate in collective bargaining, but state they will deal only with the individual.

The Giant Portland Cement Co. reports for the fiscal year ended December 31, 1919, gross earnings of $2,010,487, compared with $1,629,521 in 1918, an increase of $380,966. The net earnings from operation totaled $459,665, compared with $117,686 in 1918, and the balance, after payment of bond interest and reserve for depreciation and taxes of $152,790, totaled $273,125, compared with a loss in 1918 of $4,081.

In his annual report, Charles F. Conn, president of the company, says:

"Sale of the Giant company's Norfolk plant has not been consumated, as prices satisfactory to the Board have not been offered. The Norfolk plant has not been operated during the year.

"Comprehensive improvements to the Reliance mill at Egypt, Pa., at a cost of approximately $300,00 for the purpose of reducing number of men employed and cost of production, have been authorized, and the installation will be complete in time for the season of heavy shipments.

"The Central mill, which has been closed down since

September, 1917, will be placed in operation early in the year.

"Sales contracts for delivery in 1920 are the largest in the history of the company."

The Western States Portland Cement Company, Independence, Kansas, contemplates the erection of a new cement mill near Buffalo, Iowa, a short distance from Davenport. Contract for drilling operations to the Sullivan Machinery company of Chicago and the work of proving the cement bearing rock has just started.

This announcement followed the visit to Davenport of A. D. Stancliff, engineer of the company. The big cement concern, whose plants are valued at several millions of dollars, sent Mr. Stancliff here on cablegram orders. He had been at the company's big plant in Cuba.

The Western States has laid out 30 holes on the Cook and Sampson farms, where drilling operations will begin this week. These holes will be sunk to a depth of from 80 to 200 feet. Chief Chemist Robertson of the Western States company is here personally directing operations.

Public Service Commissioners Clement and Benn, of Philadelphia, held the fifth hearing in the long drawn out case of cement manufacturing concerns of Northumberland County against the Lehigh Valley Light & Power Company and the Lehigh Navigation and Electric Company. A fifty per cent increase of rates for power is being contested. The complaints include the Alpha Portland Cement Company, the Coplay Cement Manufacturing Company, the Penn Allen Cement Company and others. It was contended that the increased rates for power were excessive and unreasonable and also in violation of contracts. The cement companies, it was stated, had discovered that they could produce their own power far cheaper than they could buy it of the defendant corporation. They had laid their plans to set up power plants of their own, when the war prevented them from getting materials. They were forced to renew contracts with the power companies and it was stated they were anxious to be released but the defendants demanded an unfair sum for cancellation of claims.

Shortage of freight cars has not disturbed the movement of cement from Universal Portland Cement Company plants, at Buffington, Ind., in the vicinity of Chicago. Long caravans of motor trucks make daily pilgrimages to the base of supplies, according to B. F. Affleck, president of the cement company.

Under normal conditions the Universal contract calls for 100 freight cars daily, but lately not more than ten cars are available. Building operations in Chicago require cement in large quantities, and contractors met the freight-car shortage by installing motor-truck equipment to transport the material. The largest number of trucks served at the Universal plants up to date was 157 in one day in February. These trucks carried away 6,000 tons of cement equivalent to thirty freight car loads. It is reported that the daily average of trucks operating in this manner is from 140 to 150.

Fred A. Ballin, a ship-builder of Portland, Oregon, and Coy Burnett, Portland attorney, have returned from Monolith, Cal., where they participated in negotiations for the taking over by a new company of an idle cement plant and its conversion into a plant for the production of potash for fertilizing purposes. Associated in the enterprise is Aman Moore, who promoted the Oregon Portland Cement Company, Oswego, Oregon. The deal in Southern California will involve about $1,000,000 by the time the converted plant is ready to operate, they say.

The Hanover Portland Cement Company, Hanover, Ontario, Canada, will open up a new quarry at Walkerton, Ontario, to take out 1,000 tons of high calcium stone per day. The company plans increasing its output 500 barrels per day and the plant is now being changed to take care of such additional production. They use electric power and operate under semi-wet process. Have three kilns, 7x100 feet. E. D. Gruetzner is manager and J. J. Lange, Sr., superintendent.

Contractor's Atlas is a publication that is issued monthly by the Technical Department of the Atlas Portland Cement Co., 30 Broad Street, New York, N. Y., and sent free to architects, contractors and engineers. It contains interesting and worth-while articles on engineering and construction subjects. All phases of concrete construction from the plan to the finish are presented in its monthly issues. They will gladly place your name on their mailing list so that you will receive monthly copies.

The Lawrence Portland Cement Company of Northampton, Pa., are about to install a Traylor "Bulldog" jaw crusher, 42″x48″ in their quarry at Annville, Lebanon County, Pa. They have a No. 5 Champion crusher at this plant and expect to install a steam shovel for loading stone. They have two steam shovels at work removing overburden. The daily capacity is 300 to 400 tons crushed stone. Mr. C. J. Barr is superintendent.

The Dewey Portland Cement Company, Dewey, Okla., are installing a waste heat boiler, steam turbine, crusher plant and rock storage. The whole plant is being generally overhauled and remodeled to increase output and economize in labor.

In their quarry steam shovels load the stone in seven yard cars which are hauled to a 84-in. Traylor crusher, 48 by 60-in. jaw crusher and 30 by 72-in. roll. Drying is effected by shell type dryers. The grinding is done by five 6 by 22-ft. Allis-Chalmers tube mills, four 66-in. kominuters and one Hercules are used for fishing. The kilns are five Allis-Chalmers 8 by 22 ft.

The Diamond Portland Cement Co., H. D. Raff, superintendent, Middle Branch, O., will increase its kiln capacity 25%, so as to give it a daily output of 2,500 bbls. The dry process is used and clinkering is done in two 10 by 150 ft. rotary kilns. All of the equipment is run on electric power and a relatively high stage of operating efficiency is being maintained.

At the annual meeting of the stockholders of the Nebraska Portland Cement Co., recently held in Superior, Nebr., a large number of those interested were present, and all expressed satisfaction and enthusiasm at the outlook for the successful operation of the plant, and were unanimous in enlarging the same to 3-kiln capacity. The parts for the third kiln are ordered and the work of equipping the plant to care for this extra capacity is in progress. New sacking and packing equipment is being put in, so that in case of a rush like last summer 3000 bbls. of cement may be loaded in a single day. We understand that work on the

News of the Cement Mills

houses for the men on the lately acquired ground just across the highway to the north of the plant will be pushed so that no interruption may be suffered when men cannot get to and from the city in bad weather. The plant is now in operation since the coal shortage has been relieved, a stock of cement will be stored for immediate delivery. Everything is most propitious for a successful year and stockholders are well pleased with their investment.

E. C. Switzer, of Stroh, Ind., for several years with the Wabash Portland Cement Co., and formerly with the Lehigh Portland Cement Co., has been secured for general superintendent of the Petoskey Portland Cement Co., and together with his wife and family will make Petoskey his home. Robert Tripp, of Petoskey, has become assistant superintendent under Mr. Switzer.

F. L. Smidth & Co., 50 Church street, New York, have issued a folder on their agitators. The agitating basin is intended to receive and store slurry and to maintain it in a homogeneous condition. In portland cement factories it may be used to store clay slurry received from the washmill for delivery to wet grinders; or to store the ground slurry from the wet finishing grinders, or to store and mix the composition received from the correcting basins. The agitating basin is of circular or of oval form built of reinforced concrete in or above ground as found best. Slurry may also be agitated in large tanks by compressed air, but at an expense of more power than required by mechanical agitators; tanks of this kind may be built of concrete or steel and may have flat or hemispherical bottoms.

Buffalo, Iowa, is to have a cement plant. Word received there from Kansas City, the headquarters of the Dewey Portland Cement Co., states that this company will probably build a cement plant on its property near Buffalo, Iowa.

On account of the big demands for its products, the company expects to build this year.

Tests made of the limestone on the property here indicate that it contains a large proportion of magnesia, and is otherwise well adapted to the manufacture of cement. At their plant at Dewey, Okla., they derive the power from a gas engine plant of 5000 hp. capacity and maintains a daily output of 4000 bbls. with five 8 by 180 ft. rotary kilns. This rate of production will be maintained for the present. Excavating of raw materials is done in an open quarry with the aid of three steam shovels and a part of the output is utilized in a plant furnishing crushed stone for road building, ballast and construction purposes. Wm. Fowden is superintendent.

Gulf States Portland Cement Co., E. M. Confer, superintendent, Demopolis, Ala., is opening up a quarry and cement mill at Spocari, Ala., to take the place of an older operation (defunct Warrior Portland Cement Company) which will have an ultimate daily capacity of 5000 bbls. George P. Dieckmann, formerly chief chemist of the Northwestern States Portland Cement plant, Mason City, Iowa, is vice-president and general manager. The rock, which is gotten out by drilling and blasting in the quarry, is carried on 490-ft. conveyor belts to raw storage and transfer to 260-ft. distributing belts. After being reduced in a Jeffrey swing hammer mill the material is passed to two Allis-Chalmers 5 by 22 ft. raw grinding tube mills and one 6½ by 120-ft. F. L. Smidth mill, each filled with ¾ and 1-in. grinding balls, 13 tons to a mill. The clinkering is done in six 6½ by 60-ft. rotary kilns, with an aggregate present daily capacity of 1500 bbls. The finishing will be done in two No. 5 Allis-Chalmers ball mills and two Allis-Chalmers 5 by 22-ft. tube mills. All the machinery is equipped for motor drive, the present capacity of the power plant being 1600 hp. For the enlarged output above referred to additional tube mills, kilns and ball mills will be installed, together with auxiliary equipment, and on the subject of future economies in operation to be effected, Mr. Confer says: "We are installing one large clay excavator for our lime rock quarry. Our stone is easy to quarry, this being very soft lime, what is known as the Selma limestone chalk. This excavator will reduce our quarry force of men to about 40 laborers. With this method of handling the stone it will only require 3 men to quarry 500 tons in 8 hrs. After the lime is quarried with this excavator it is measured and weighed right at the quarry and dumped on a 30 by 1000-in. conveyor belt, which operates from the quarry to the plant. Sixty feet of conveyor belt is extended from the excavator to the stationary belt as the excavator works into the quarry face. The quarry face is 60 ft. high, and the excavator will cut rock 60 ft. high and 54 ft. radius. Our raw grinding department is large enough to operate in day time only. This is one of our methods to effect economies in the cost of manufacturing portland cement. The above improvement was one of vital importance to reduce to a minimum the labor in handling the raw material."

At the recent annual meeting of the New England Builders' Supply Association the following resolution met the hearty favor of those assembled and was passed unanimously.

WHEREAS, It has come to the attention of the New England Builders' Supply Association that certain cement manufacturers have adopted or followed a policy of selling their products directly to various departments of the various states, and especially to the Highway Department of the State of Connecticut, and

WHEREAS, It is, in the opinion of the New England Builders' Supply Association a practice that is detrimental to the interests of all parties concerned in such direct sales, and

WHEREAS, There are at the present time dealers in mason supplies who are so situated that they can economically and efficiently handle the requirements of the various states and departments thereof, now therefore

BE IT RESOLVED, That in the opinion of the members of the New England Builders' Supply Association, the best interests of all parties concerned would be furthered by the discontinuance by the manufacturers of all materials regularly handled by mason supply dealers of their policy of direct sales to states,

counties, municipalities and their various departments and all industrial concerns, and

BE IT FURTHER RESOLVED, That a copy of this resolution be forwarded forthwith to the manufacturers of portland cement regularly operating in the New England states.

A daily output of 4,000 barrels will be the capacity of the Pyramid Cement Co., recently incorporated at Des Moines, Ia. The company purchased one hundred acres of land on which to locate its plant, situated about half a mile from the plant of the Hawkeye Portland Cement Co., on three railway lines. Rock will be shipped from the Pyramid quarry at Gilmore City, Ia., to be used in the construction of the plant, which is expected to start about April 1. A rock crushing plant will be built at once and rock will be prepared both for construction work and commercial sale. E. Struckman, formerly operating superintendent for the Hawkeye Portland Cement Co. is vice-president and general manager of the Pyramid Company.

The Cape Gerardeau Portland Cement Company of Cape Gerardeau, Mo., have ordered a new 1250 kw. steam turbogenerator and two 705 hp. waste heat boilers with superheaters and will soon be in operation. Economizers and induced draft fans will also be installed.

By blowing into the kilns 55% of the air required for combustion instead of 25%, as formerly operated, the capacity of each kiln was increased from 750 to 1000 bbls. per day. Aging clinker in the open for about 60 days resulted in increasing the output of the finishing mill 25%.

As a "stand-by" unit in case of breakdown, or when plant is shut down, a new 150-kw. turbogenerator has been ordered.

This plant operates two kilns, 9 by 30 ft., fired with pulverized coal. Finishing is done by one No. 2 Duplex Sturtevant ring roll and three 6 by 16-ft. Bonnot tube mills. Fuel is pulverized by four 30-in. Griffin mills. Machines are all motor driven by current supplied from the company's own power plant, with a capacity of 2800 hp.

Numerous improvements are contemplated, some of which are now being installed at the plant of the Phoenix Portland Cement Company, Nazareth, Pa. Among these may be mentioned waste heat boilers, crushing plant, preliminary grinders, silent chain in place of belts, steam shovel for quarry, and locomotive crane for coal storage.

Pulverizing at the Phoenix cement mill is accomplished by gyratory crushers and Williams semi-vulcanite hammer mill. The conveyor system is one specially designed for the service. A 6 by 60-ft. coal fired Vulcan dryer is used for drying. Preliminary grinding is done by Bradley Hercules mills, while finishing is accomplished by three special 5 by 22 ft. tube mills driven by 200 hp. Westinghouse motors connected by silent chain. Four Vulcan 8 by 100-ft. rotary kilns are used for burning the clinkers. The output is 2400 bbls. per day.

Preliminary grinding is done in Allis-Chalmers and Smidth ball mills; finishing in Smidth tube mills; steam and electric power.

Fred H. Franks, vice president of the Bath Portland Cement Co., Bath, Pa., recently filed the deeds for a 300-acre tract of land at Sandt's Eddy. The company, it is reported, contemplates erecting another plant on the site and at the same time operate another section of the land, which contains large deposits of fine cement making rock. The same patch of land was at one time owned by the now defunct Quaker Portland Cement Co.

Two adjoining properties at Martin's Creek, Pa., each over 100 acres in area, and belonging to Joseph R. Shimer and Mrs. Daniel Engler have been purchased by the Alpha Portland Cement Company. The Joseph Shimer farm adjoins the William Shimer farm, one of the first properties the Alpha bought at Martin's Creek. Recently the Alpha Company purchased the large Howell farm, at Martin's Creek.

Sixteen years of noteworthy service as an official of the largest cement company in Illinois were climaxed last month by the news that Edward J. Dalton, secretary-treasurer of the Marquette Cement Manufacturing Company, La Salle, Ill., has resigned to become vice-president and general manager of the Federal Cement Company, a $4,000,000 concern, which will erect a large cement manufacturing plant near Fort Dodge, Iowa. The advancement of Mr. Dalton to this berth marks the appearance of a new figure among the leaders in the cement industry of this country.

The Federal Cement Company, located at Rutland, Iowa, numbers in its personnel the most important financial interests of Fort Dodge, it was learned, but further details are not announced for publication. Mr. Dalton will have complete charge of all operation and construction matters, the directors recognizing his unquestioned ability in these lines.

Edward J. Dalton came to La Salle, Ill., in 1904 as auditory of the Marquette Company and two years later was elected secretary, the additional duties of treasurer being added later. From the outset, he contributed to the cause of community betterment and as the Marquette grew, to no inconsiderable extent because of his capability, Mr. Dalton was called upon to give more and more of his time and ability to the furtherance of the public good.

Announcement was made last week of the purchase of 100 acres of the Polk farm in southwest Des Moines by the newly organized Pyramid Portland Cement Company as a site for their plant, upon which construction will commence this spring.

The tract is one-half mile this side of the Hawkeye Cement Company plant, and the consideration is stated by President John L. Bleakly as approximately $100,000.

The Pyramid Company has a force of engineers at work making a survey of the site, and expects to install a rock crushing apparatus at once, to prepare material for use in construction of the plant, and for commercial sale.

The state railway commission and the Minneapolis & St. Louis railway company have both informally approved a contract for the transportation of limestone from the quarry purchased by the Pyramid Company at Gilmore City, under the special freight rate allowed new industries by state law.

Material for construction of trackage and engines and cars required in construction of the plant have already been ordered by General Manager E. Struckmann of the Pyramid Company.

The plant will have an initial capacity of about 2,000 barrels per day, under present plans. It is not expected that manufacture of cement can be commenced before the spring of 1921.

News of the Cement Mills

A cement manufacturer in the Central West uses the following method of proportioning limestone and shale at the raw material bins. The mix is controlled by the wet process, and so the raw materials are proportioned by volume instead of weight.

The raw stone and shale are sent to large concrete hopper bottomed bins after they pass the preliminary crushers. Underneath these bins there is a track and pasasgeway, so that a car may run under the chutes and be loaded.

The car used for this process is a small steel electric-storage-battery-driven car. The box bed has a partition which can be moved to reproportion the amounts of shale and limestone. A graduated scale along the edge of the car bed enables the chemist to figure out how much the partition should be moved for a corresponding change in the raw material proportion.

When loaded, the operator runs the car out to a dumping hopper and its contents are side-dumped into a pit which feeds to an elevator for delivery to the wet kominuters.

About a year ago there was installed at the plant of the Southwestern Portland Cement Company, El Paso, Texas, a Williams crusher and an apron conveyor 60 inches wide, for handling stone, which has been very successful. The conveyor is double beaded and depressed in form to receive a 2½-inch oak lining the full width. The chain rollers run on 20-lb. rails, with a slight incline from the hopper to the discharge into the crusher. This conveyor was designed to carry 135 tons of rock per hour and is driven independently of the crusher.

The crusher is of the hammer type made by the Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. This crusher is what is known as the "Jumbo" type and is one of the largest and heaviest hammer mills in operation. The side frames of this machine are from 2½ to 3 inches thick and of grey iron or semi-steel. This machine has 3-inch manganese steel breaker plates. The shaft is 8 15/16 inches in diameter.

This mill is taking about 90 tons of rock per hour of one-man and two-man sizes and reducing it in one operation to pass a 2-inch ring. The cages which regulate the size of the output are made of heavy bars, put up in sections, three bars to a section, similar to a grate bar, and are made to stand great strain and wear.

The apron feeder forms the bottoms of the bins so that there is no tendency for the stone to stick in the bins. It is claimed that the feeder can be operated at a speed of 15 feet per minute. The horsepower required to operate the feeder is so small that it can be driven by a 3-inch belt.

The Security Cement & Lime Company maintains at its cement plant a conference room for foremen. In this room is a recording apparatus. The row of counters above this recording chart shows automatically by means of electric contacts the number of revolutions of the feed screws of the five kilns.

On the chart below is recorded the kiln performance, showing the time during which the kilns were revolving and any stoppages, giving both the time and the duration of the stoppage.

From these it is possible to calculate the approximate production of any kiln for the 24 hours of the day, or for any part of the day. These figures are posted on a blackboard in this room.

It is becoming standard practice now to separate the motor drives of cement grinding machinery from the machines themselves by practically dust-tight partitions. The practice was adhered to by the Indiana Portland Cement Co., Greencastle, Ind., whose new plant was illustrated and described in the February issue of CEMENT AND ENGINEERING NEWS.

In rebuilding or improving a number of older plants the same practice has been adopted by addition of concrete walls between the tube mills and kominuters and their motor drives. Such an improvement was recently made at the plant of the Hawkeye Portland Cement Co., Des Moines, Ia. The tube mill and kominuter shafts extend through the partition wall and are driven by means of large pulleys by individual motors.

Nearly all rock grinding and pulverizing plants experience trouble with motor drives from dust, and about the only positive cure seems to be the isolation of the motors in practically dust-proof rooms or compartments wherever it is possible or feasible to do so. Granite or silica dust is much worse on motors than limestone.

A case of extraordinary efficiency is revealed in a recent report made by J. C. Josse, superintendent and safety engineer of the Continental Portland Cement Co. of St. Louis to the Central Mississippi Valley Division of the National Safety Council.

This report, according to Carl L. Smith, secretary of the division, shows that the cement company has paid a total of only $300 in accident claims during the last six months, whereas before the institution of organized safety work at the plant the company had paid an average of $1,800 a month in accident claims.

In recognition of his work in the safety movement, Mr. Josse has been appointed chairman of the Industrial Committee of the Central Mississippi Valley Division of the National Safety Council.

At the firing end of a cement kiln there is always a certain amount of air which leaks in between the rotating kiln and the hood. The ordinary method allows the cold air to come in all around the kiln and when it hits the firing zone there is a reduction of temperature.

The following is used by the Bonner Springs Portland Cement Co., Bonner Springs, Kans., to pre-heat this air leakage from the hot clinker as it falls from the kiln.

Instead of the flat fire-brick hood which leaves a space of several inches between it and the kiln, the hood used here has a sheet-iron, fire-brick lined band around the outside of it except at the bottom where the clinker falls out. The end of the kiln extends in under the band and close up against the fire brick lining of the hood. The iron band is about 20 in. wide and the end of the kiln extends under it several inches.

The air is drawn in chiefly from the bottom—or from over the hot clinker pit, instead of from the sides and top of the hood. Thus the air is heated by the clinker

and does not have a cooling effect on the combustion gases when it reaches the firing zone.

The system of clinker cooling in use at the Hawkeye Portland Cement Co., Des Moines, Iowa, is worthy of mention. The coolers are set end to end with the kilns and discharge the clinker into pits outdoors, from which it is taken by bucket elevators to concrete storage bins. The coolers are equipped with perforated end sections and ring plates at the ends to prevent their discharging larger pieces of clinker than the elevator can handle. The plant was recently rearranged so as to utilize for storage of clinker the cylindrical reinforced-concrete bins formerly used for finished cement. The clinker is drawn from the bottom of these bins by table feeders to a belt conveyor in a concrete tunnel, and thence transferred to the grinding room.

At the annual meeting of the stockholders of the Petoskey Portland Cement Company the plans for construction work on their new cement mill were discussed fully, covering the work which is to be undertaken as soon as the snow is off in the spring.

Contracts are let for buildings, machinery, etc., and a large force of men will be put to work as soon as spring opens. Manager, superintendent, assistant superintendent and heads of departments have their plans carefully laid out for the building campaign while the sales department reports one of the heaviest seasons on record booked for 1920 for crushed stone.

Plant Efficiency by Analyzation

Advantage of Installing Belts on Recommendations of Belt Engineers Who Investigate Needs of Every Service

By R. W. Barnes

It is a remarkable fact that the up-to-date engineer no longer permits himself to be absorbed in the detail of his plant operation, but has systematized, so to speak, everything in such a way that he is able to determine in a remarkably short time exactly where his losses in production occur and where the most effective operation is found.

The exact reasoning or exact methods which the engineer uses are quite alike in the different plants throughout the country, regardless of what particular industry it may be. He keeps individual machine record cards, showing the operation and production, loss of power and overhead and many other items which determine the exact efficiency of the machine, and in the same way is rapidly realizing that his transmission belts are of the same importance as the machines which do the actual work; that is, the final work in his particular plant.

This has come about due to the fact that the belting is of vital importance, inasmuch as it is the connecting link between the prime mover and the machine to be operated.

Furthermore, the plant superintendent or purchasing agent, master mechanic or chief engineer, no longer applies his belts in a haphazard manner, but is taking every precaution to see that the proper belt is applied in the proper place—for the particular kind of work it is especially adapted for. In one of the big flours mills in this country, the owners permitted a belting specialist to come into their plant and analyze every drive, specifying the particular belt most adaptable to the particular work on each machine.

These belting engineers have a thorough training before making any recommendations. They not only take pulley sizes, length of centers, and horsepower to be delivered, but study the exacting conditions under which the belts must operate and endeavor to determine the highest degree of efficiency possible in order that the exact belt for each purpose may be applied.

The coveyor belt used in carrying grain from the receiving room to the elevators and also from the elevators to the mills in a large flour mill is 28-oz. duck with a rubber friction surface instead of a rubber cover, which in most plants is thought to be the best for this particular type of work, as the actual service which the belt is called upon to do is not of such abrasive nature as to demand a rubber cover. Grain is such unabrasive material that a rubber cover is superfluous and the additionl cost for the cover does not warrant its purchase.

It is the purpose of the engineer who makes the belt installation to analyze these particular conditions, specifying a belt which will operate the most efficiently at the lowest possible ton per hour cost and the recommendations are made after a thorough analysis of the conditions surrounding the particular drive and with a knowledge of work from actual plant experience.

Many plants have adopted this method of belt installation and are operating under the recommendations made by these particular men because they feel that from their experience in the belting field that their recommendations are as accurate as can be obtained and have given full confidence in their work.

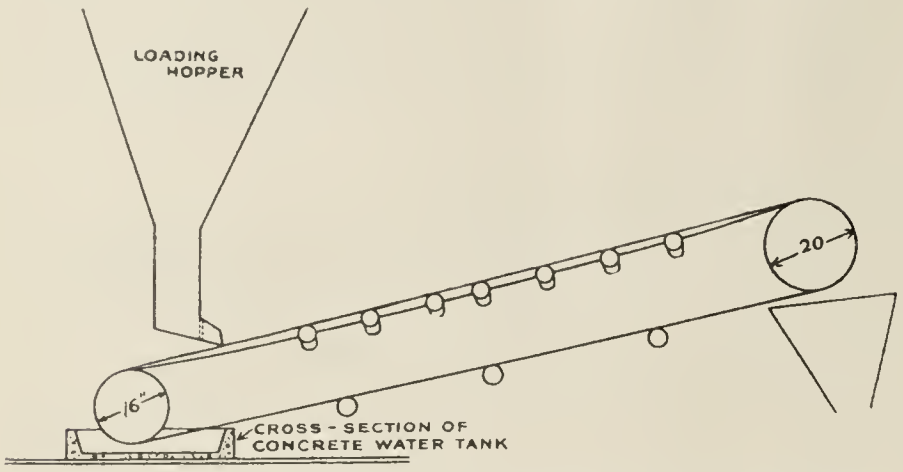
The Nast Bros. Lime & Stone Co., of Marblehead, Wis., has a plant which is entirely equipped with the belts specified by one of the engineers of a rubber belting manufacturer. This plant was installed with rubber belts throughout as the result of a particular installation in one of the company's other plants which was far more successful than any other installation.

There is no question of a doubt in my mind but what the method of plant analyzation is the key to successful plant operation and if the plant operators will come to realize the full value of a plant analysis, there is no question but what their belting costs will be reduced, and they will be able to keep a record of the belting costs without the usual haphazard manner in past years.

Hot clinkers, 200° and over, to be carried from open storage to the grinding mills, were the crux of the conveying problem put up by the plant superintendent of a cement company to the Technical Service department of a rubber belting manufacturing company, who gave the situation expert study embracing every process in cement manufacture. This was an unusual problem. The clinker could not be cooled sufficiently in the processes previous to conveying. The best thing to do would be to provide some means of cooling it as it came onto the belt. So two recommendations

were made: a heat-resistant conveyor belt, 16 inches, 5 ply, known to be capable of withstanding as much as 200°: and a cooling vat through which the belt might run as it struck the tail pulley and come up dripping with a film of cold water that would cool the clinker dropping from the hopper.

Up to September 1, 1919, after six months of operation—this heat-resistant rubber belt conveyor had carried 61,000 tons of clinker. The cement company credits a saving of $300 in belt costs alone to this conveyor. Besides, it has effected a high operating economy. A letter from them states the Company



Outline of Conveyor Belt in Cement Mill. Total Length 72'—2". Head Pulley 20"x18". Tail Pulley 16"x18"

is "so pleased with its performance that we have ordered a duplicate for replacement, although from present appearances this belt will continue to give good service for some time."

Portable Belt Conveyors

Portable belt conveyors for handling material horizontally or at a slight incline are described and illustrated in a new folder entitled, "Type B Portable Belt Conveyors." This folder, just published by the Portable Machinery Co., of Passaic, N. J., contains prices of these machines which are made with 16 in. wide belt and in standard stock sizes as follows: 12 ft. 6 in., 16 ft., 19 ft. 6 in., 23 ft., 26 ft. 6 in., 30 ft., 33 ft. 6 in. and 37 ft.

These machines, in addition to being used for handling coal, sand, crushed stone, fertilizer, etc., are being used for conveying many manufactured products, bagged material, such as cement, etc.

Used in series or in conjunction with fixed conveying systems, they afford a flexible, convenient and automatic conveying arrangement. Ask for their catalog No. 95.

Test of Old Storage Cement

During the progress of the war large stocks of cement were often shipped to various jobs at the beginning of the work and stored until needed. In some cases this storage period amounted to more than a year, and several such samples were submitted for test. The results of tests made by the U. S. Bureau of Standards indicated reduction in strength for the storage cement, but this change was not marked for material which had been stored on the job for less than one year. One lot which had been in storage over two years gave the same strength in compression for 1:1½:3 concrete as was obtained for a 1:2:4 concrete made with the same brand of new cement. The old cement when gauged with a 5 per cent calcium-chloride solution showed an increase of about 30 per cent at seven days over the same cement gauged with ordinary mixing water.

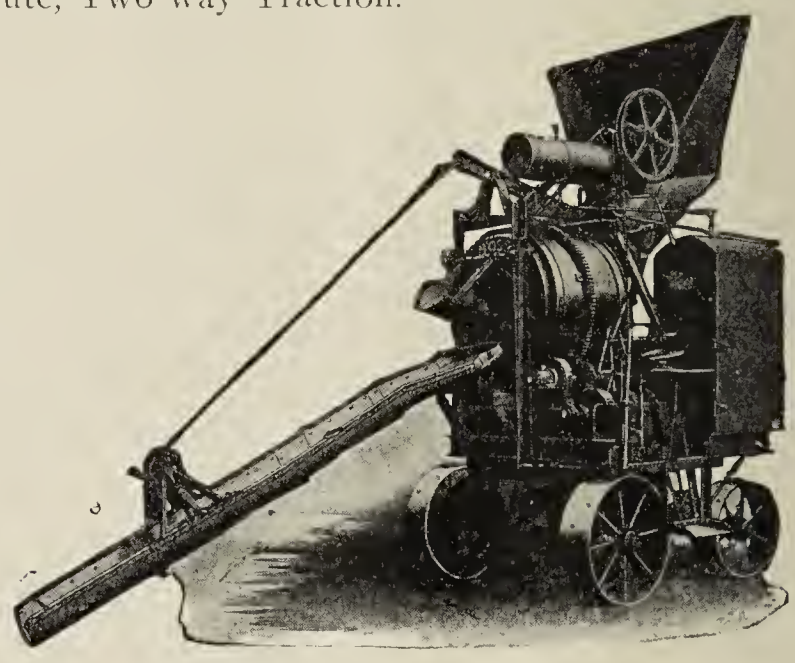
High Drum "Non-Tip" Boss Lincoln Highway Pavers

The modern improvements in paver design and construction which meet the demands of the paving contractor for higher efficiency and greater economy are well illustrated by the improved types of Boss Pavers.

These machines—known as Lincoln Highway Pavers—embody all the latest practical and successful improvements and refinements in up-to-date paver construction. They meet the requirements of all sorts of paving jobs to the satisfaction of a large number of users. They are lighter and far stronger than old-style pavers, turn out more and better concrete in less time and with less expense for labor.

Lincoln Highway Pavers are built practically entirely of steel. They stand up for the hardest service without breakdowns and delays. One man handles them—all operating levers are banked within easy reach. They offer the contractor his choice of gasoline, kerosene, steam or electric power, and the gasoline and kerosene machines have demonstrated the fact that they are as reliable as steam. They are actually about $10 a day cheaper in operation.

These pavers are all equipped with Hyatt Self-Oiling Roller Bearings, Novo or Ideal frost and dust-proof engines with high tension magnetos, Automatic Power Charger, Measuring Pressure Water Tank, 14 foot Chute, Two way Traction.



Boss Lincoln Highway Pavers

Non-Tip Feature

Lincoln Highway Pavers are all built with high drums—bottom of discharge spoon six feet from the ground. Danger of tipping is eliminated by specially wide track and wide tires—machine will not tip. The high drum gives steep pitch to the chute which swings from curb to curb. Chute is sectional—with three gates—and allows dumping of concrete right up to the paver. This means less moving of the machine and less time lost.

Boss Lincoln Highway Pavers are manufactured by the American Cement Machine Co., Inc., at Keokuk, Iowa. The Boss factories are located within a stone's throw of the great 300,000 horse power hydro-electric dam and are operated by electricity. In addition to pavers the company manufactures a full line of mixers in all used sizes and for all purposes—also grouters, hoists, pumps, backfillers, material elevators and concrete carts. Their 1920 catalog, illustrating and describing the complete line, will be mailed to any contractor interested upon request.

The Business of Selling Concrete Burial Vaults

There is no doubt that in the great majority of cases it is relatively harder to create a demand for and sell concrete products than it is to make them. Of course, these two widely separated branches of the industry have an inherently mutual relationship in this respect: It is easier to create a demand for a product if it is well made. Granted, then, that the product is well made, there is much pioneering to do before it reaches the position of "a good seller." To help its customers overcome these difficulties, a prominent firm of mold manufacturers is issuing the following. Read it through—it has some good pointers on selling—even if you don't make burial vaults.

How to Sell the Automatic Sealing Steel Reinforced Cement Burial Vault

A manufacturer of concrete burial vaults was asked what he thought of the future of this business. His reply was an enthusiastic one.

"The future of the burial vault business is already here," he said.

This man went on to explain that his first year in business he sold seven vaults; the second year he sold about twelve times as many, while the third year showed another substantial increase, and the present year bids fair to carry him way beyond last year's mark.

This man gives it as his opinion that if the cement burial vault business does not thrive, there are just two men who are responsible, the two men who must work together—the manufacturer and the undertaker.

It is pretty generally conceded among all successful manufacturers of burial vaults that it is only through the co-operation of undertakers that these vaults can be marketed successfully. This means that the undertaker should get a certain definite percentage on each vault. This percentage should not be considered as any form of graft, or anything other than a legitimate profit on goods which pass through his hands. The undertaker is, in a real sense, the dealer through whom the vault is marketed, and it is as legitimate that he should make a profit on the vault as on the casket which goes into it. Those who employ him expect him to suggest the various possibilities for the proper preservation of the body and very often the mere suggestion of the enduring qualities of concrete will create a demand for a concrete burial vault.

Sometimes the undertaker will be willing to carry a sample vault in his rooms, which may be a full sized vault or a miniature model. In the latter case it can be allowed to occupy window space, or rest on the sample table in his parlors, where he can make a demonstration to his purchasers of the sealing principle of this vault. He can show the general style of it and how neatly it is constructed. Where circumstances permit, even a full sized vault can be put on occasional exhibition.

The manufacturer above referred to, who is doing a general line of concrete contracting work and making a number of concrete products at his shop, says that the burial vault business is developing so rapidly that he expects in a short time to be obliged to devote all his time and attention to it.

The reason this man only sold seven vaults the first year was because he depended upon the cemeteries to push the business for him, and he thought the undertakers ought to be satisfied with a little or no profit whatever. Then he woke up to the fact that these seven had been sold because the parties buying funeral goods insisted upon having them, and that the cemeteries were "knocking" his product and pushing the sale of slate, stone and brick vaults for this purpose The undertakers were not willing to sell his vault for nothing, and if they looked to their customer to pay them for this vault, they expected a good profit for selling it. The cemetery association directors even tried to intimidate him by telling him that it was the rule that only slate, brick, marble or stone vaults would be allowed in the cemetery. They tried to enforce this by locking the gate on him, but fortunately he is a man who is not daunted by such things and eventually he won out.

The manufacturer of vaults often asks, "What is a fair profit for the undertaker to make?" And our answer is given below in a table of figures on the various sizes.

Don't fool yourself into believing that Mr. Undertaker will be satisfied with a $5, or even a $10 profit. Take our advice and judgment in this respect, for we are in a position to know and have found by experience that the best incentive to throw out to him is to let him sell it at a good round profit. Hence, the figures as given in the table below.

If you pursue this plan, Mr. Undertaker will become interested, and immediately talk these vaults to every buyer of funeral goods and will take an interest in showing the miniature model because he realizes he can get the vault handy and quickly—he has nothing invested in stock and all he needs to do is step to the telephone and give you the order.

The undertaker is a known credit risk in your community. You haven't the time to peddle vaults, for that's the undertaker's job, not yours.

The following table gives sizes and dimensions of vaults that can be furnished and the wholesale and retail prices that should govern each sale, although these may be raised or lowered if desired.

Inside Dimensions of Vaults

Size No.	Style No.	Length	Width	Depth	Price
2	20	4 ft. 8 in.	20 in.	18 in.	$28.00
2½	22	5 ft. 4 in.	22 in.	20 in.	35.00
3	24	5 ft. 10 in.	24 in.	20 in.	38.00
4	26	6 ft. 10 in.	27 in.	24 in.	45.00
4½	30	7 ft.	28 in.	24 in.	50.00
5	33	7 ft. 2 in.	30 in.	24 in.	55.00
6	36	7 ft. 4 in.	32 in.	24 in.	60.00

The figures under the head of style number represent the net wholesale price of each size vault to the undertaker, while the figures to the extreme right, last column, represent the undertaker's retail selling price.

For illustration, Style No. 20 means $20 wholesale; Style No. 22 means $22 wholesale. The wholesale price of each size vault is called a style number so that in case the undertaker wishes to show the prices to the buyer he can do so without disclosing the cost price.

It is of considerable importance, too, that men of intelligence should be on hand at the time of the funeral to seal the vault, if the undertakers demand it, when the services are over. An ordinary laborer could, of course, do this just as satisfactorily, but there will always be a number of relatives and friends of the deceased who will linger behind to see the vault closed and who in many cases will want some explanation of the vault itself. It is, to be sure, no occasion for making a sales talk, and yet the mere statement of the purposes and merits of the vault will be sufficient to leave a lasting impression with many.

By keeping in touch with the undertakers in surrounding towns, a manufacturer of these vaults can largely extend his business and will have orders coming in by telephone at an increased profit without any increased overhead expense and with several dollars

of "velvet" to the undertaker, which is inclined to keep him in a favorable frame of mind.

Should you, in extreme circumstances, have occasion to sell a vault direct, then turn around and hand the undertaker, no matter where he may be, or whether he has been using your vaults regularly or not, a check for his profit. This will have a further tendency to keep him in a favorable frame of mind and to push the sale of your vaults

Where an undertaker is found who persists in trying to discredit concrete burial vaults, it is just as well to let him alone for a while, depending on the use of these vaults placed in his own territory and in the surrounding territory to create a demand which will eventually bring him to time and get him to talking your vault.

Newspaper advertising, moving picture advertising, window display and various other methods have been resorted to by many manufacturers of the concrete burial vaults, all of them helping to create a demand and making it easier for the undertaker to book the order. But it is well never to lose sight of the fact that the undertaker is the man who is at hand when the real need arises, so that he must be cultivated and made friendly wherever possible.

It goes without saying that the manufacturer must make a good product in order to hold his business. And, not only must the vault be made dense, strong and durable and waterproof, but it must be neat in appearance. It is also well to have some satisfactory means for handling and hauling the vault so that there may be no hitch or delay in the proceedings at any point and so that the public may not get the idea that these vaults are heavy, cumbersome and difficult to manage.

A Very Complete and Modern Equipped Gravel Washing and Crushing Plant

The plant of the Wilcox Company at Fontona, Wis., is a model of its kind and is perfectly equipped to produce highest grade of washed sand and gravel.

The company owns about 38 acres of gravel beds at the western end of Lake Geneva, where they are engaged in preparing washed and perfectly graded gravel to meet the requirement of the Chicago market.

At present the plant is prepared to ship 500 tons a day, the greater part going out on the railroads to the Chicago yards of the Wilcox Company, located at 3690 Milwaukee avenue, although the facilities are excellent for delivery by trucks or wagons. Electricity, through Westinghouse motors, is used to drive all the machinery and equipment except the Bucyrus shovel used for excavating the gravel and loading it into the cars.

View of the Washing, Conveyor and Crushing Department

The Bucyrus Steam Shovel Loading the Gravel

A narrow gauge trolley line runs from the shovel to the switch and thence to the top of the incline. An electric locomotive handles the bottom-dump cars to the foot of the incline. At this point a cable is attached and the cars quickly drawn to the top. Here it is dumped and returns to the switching yard. Automatic switches send the loaded cars to the side track and allow the empties to come straight through.

While the large gyratory will take any stone passing a 10½-inch grid, there are a good many boulders exceeding this size, and these are forming a pile at the rear of the incline. The best of these are used for the field stone walls of the neighboring summer houses. A 1¾-inch grid now separates out the larger stones which go to the breaker which reduces them to 4 inches and under.

The next course in crushing is by an Austin No. 4 Crusher which will take anything up to 4 inches. The product is again screened and the portion still too large passes through a Symons Disc Crusher which works on material from 1½ inches down.

The finer portions which have passed the screens, are, with the crushed material, carried by a 61 foot bucket elevator to the top of the bins or "silos." Here all the materials are thoroughly washed (a centrifugal pump furnished by American Well Works, Aurora, Ill., supplies the water), to remove any dust, clay or loam which may have found its way into the mix, and the mass is graded into five regular sizes, known as Torpedo, Roofing, No. 8, No. 9 and Dust. These five grades find their way into four circular bins, one bin being divided by a cross partition. These bins are 14 feet in diameter, one being 34 feet high, two 32, and one 28 feet. The bins are arranged to load either cars or wagons, as may be seen from the illustrations.

As only a small percentage of the gravel is fine enough for ready use, the crushing machinery is kept busy most of the time. The large proportion of crushed material in the product of this plant accounts for the unusual strength of concrete made with it. The same is true of the torpedo sand. Being largely crushed rock it is sharper than many other sands, and is usually given a preference when strength is required.

This company has a large retail yard in Chicago, where large quantities of the various sizes are stored, thus keeping the pit working steadily.

News of the Concrete Products Factories

Every thriving business will disclose some definite policy which has been responsible for its success. When Isaac Grogg started to make concrete block, he determined to turn out a good product or none. During the ten years or more he has been making block in Auburn, Ind., he has adhered strictly to this policy. Evidence of the popularity and great demand for his products may be seen everywhere in Auburn, where his plant is located. In fact, so great has been the demand for his block that he has never been able to supply all orders in his home town, consequently he has not shipped to outside points.

Much of Mr. Grogg's success may be attributed to the fact that he early recognized that if his block were to be accorded the popularity which they merited, they must not only be strong and durable but also attractive. He sells very few rockface block and does so only when he cannot convince his customers that his other block are more desirable. Most of his block are either smooth or tooled face. Smooth block which are intended for residence construction are usually made with a special facing containing crushed granite. Structures in which these blocks are used are very attractive.

Mr. Grogg also pays particular attention to architectural details and has developed sills, lintels, porch columns and other concrete trim which can hardly be surpassed in beauty of line and surface. What Mr. Grogg has accomplished is within the reach of every manufacturer of concrete block. He places quality first always. He has established such a good reputation for dependable work that he has acquired a firm grip on the block business in Auburn.

The Metzger Concrete Products Company, Lima, Ohio, was recently incorporated with a capital stock of $40,000 by W. E. Metzger.

The Boyne City Silo Company, Boyne City, Mich., a new organization, has equipped its plant to build patented concrete silos and other cement work on a large scale.

The Huntington Architectural Stone Company, Huntington, W. Va., recently organized, has purchased of W. H. Fisher hydraulic ramming concrete stone and a Frank mixer.

The Farrell Coal and Cement Products Company, Wheatland, Penna., recently incorporated, has purchased the following equipment. Ideal block machine, Automatic Sealing Vault Company's burial vault molds and a Kent continuous mixer, which with two men produces 800 blocks per day.

The Eau Claire Concrete Company, Eau Claire, Wis., are also manufacturing burial vaults. After they are finished they are left in the forms (furnished by the Automatic Sealing Vault Co.) for three days and then the forms are removed and the concrete is given four days to dry. The vault is made of waterproof cement and is reinforced with strap iron. At burial the vault is lowered in the grave and at interment the casket is then placed within the vault. After this the cover is placed on the vault and by an automatic process fastens itself securely over the vault proper. This makes the vault air tight and waterproof.

The Porter Cement Products Company, Barberton, Ohio, has recently incorporated, capital stock $10,000, by H. J. Porter and J. C. Baker.

F. E. Muzzall & Sons, Crown Point, Ind., are installing new equipment for the manufacture of slush poured concrete building blocks, which produces an ideal and enduring building unit.

The Concrete Products Corporation, Greenville, S. C., recently organized, capital stock $5,000, have purchased a Helm brick machine and a Smith mixer. They are in the market for two brick machines, a concrete block machine and a roofing tile machine.

The Watertown Concrete Stave & Silo Company is the name of a new organization in Watertown, S. D., just incorporated, capital stock $100,000, by J. J. Heimark, H. K. Solberg and H. R. Hanson.

A new business firm was announced recently when George C. Kng, late manager of the Cement Products Company, Spencer, Iowa, and Pete Nelson entered into partnership. The firm will own and operate the Spencer Cement Block Works and the Nelson-King Construction Company, handling washed sand, screened gravel and cement building blocks and also building concrete elevators, silos, disposal plants and general buildings.

Both of these gentlemen are well known in Spencer and Clay County. Mr. Nelson came here five years ago and organized the Nelson Cement Block Works, it now being one of the big institutions of the city. Mr. King has been here three and a half years with the Cement Products Company and has been interested in civic and municipal affairs prominently, being a member of the Spencer city council now.

About twenty-five men will be employed in the cement block works the year around, while the construction company will employ from twenty-five to forty. The new firm already has a number of building projects, having the contract for elevators at Jolley and Glidden and for a disposal plant at Bode. Louis A. Folden of Chicago, who has been with the Portland Cement Company, has been employed as construction engineer of the firm and expects to be able to furnish plans and specifications for buildings.

Art Wolk, Seymour, Wis., has purchased a machine and will manufacture concrete drain tile.

During the first nine months of 1919, Vet Pettengill, a concrete block manufacturer at Rock Rapids, Iowa, sold approximately 54,000 cement blocks and 117,000 drain tile, the block being 8 by 8 by 24-inch anchor block and the tile ranging from 5 up to 12 inches. His sales were cut down a great deal during August and September, however, by the car shortage which made it impossible to get cement. The block in Mr. Pettengill's yard is always arranged with unusual care as he finds the neat arrangement of block is a help in a good many ways. It creates a favorable impression upon the customer, it helps the men that make the block to take pride in the work they have done, it helps

the manufacturer to know what he has on hand and what he is likely to need soon. It also keeps the block in better shape and allows him to pile a larger amount of stock in a smaller piling space.

"There are a few pointers about the block business that I think every product manufacturer should observe," said Mr. Pettengill. "Always make the block the same—the best you know how. Don't sell block to get rid of them, but to help someone to make a substantial building. Get a good profit but do not try to get rich in one season. If the products manufacturer will keep a neat, attractive plant and show his customers that he is really trying to help them, he is bound to succeed."

The Long Beach Cement Products Company, A. F. Haggren, manager, Long Beach, Calif., are moving into a new building which they have recently completed.

The Houghton Cement Block Company, Charleston, W. Va., recently organized, has purchased an Ideal concrete block machine and a Blystone mixer.

The Lankford Vault and Concrete Company, Accomac, Va., recently organized, operate a multiplex concrete block machine and a Blystone mixer. They have their own patent molds for making concrete burial vaults and are now negotiating for molds for making cement posts.

The New Munich Cement Products Company, New Munich, Minn., recently incorporated, operate a Dunn cement drain tile machine and a Multiple block machine. They expect to add other equipment in the near future for makin various concrete products.

The Granette Products Company, Des Moines, Iowa, recently organized, have a factory in operation to manufacture concrete building trim and a line of high class ornamenta concrete. Will also manufacture monuments, tombstones, lighting standards, etc., made in wooden, glue and plaster molds. They have purchased concrete building block machines of Century Cement Machine Company, Rochester, N. Y. and cement burial vault molds from Norwalk Vault Company, Norwalk, Ohio.

The Elk River Concrete Products Company, Elk River, Minnesota, report a prosperous business. This company manufactures concrete blocks in molds furnished by the Anchor Concrete Stone Company, Rock Rapids, Iowa, and cement sewer pipe in molds furnished by the W. E. Dunn Mfg. Co., Holland, Mich. They use a Little Wonder mixer in their plant.

The Prairie Cement Products Company, G. I. Lengst, president, recently organized at Prairie du Chien, Wis., have purchased a Hamilton building tile machine, a Helm block and brick machine, D. & A. post molds and a cement mixer from the American Cement Machine Company, Keokuk, Iowa. They expect to also purchase a machine for manufacturing roofing tile.

The Colonial Concrete Products Company, Glenshaw, Pa., Theo. Smith, vice-president, Wheeling, W. Va., started to manufacture concrete products about a year ago and are enjoying a very good business. They operate a Hansen roofing tile machine, a Besser block machine, a Helm brick machine, a Multiplex chimney block machine and a Blystone mixer.

Hubert T. Prosser, Hamlet, N. Carolina, has purchased a Helm brick machine and will start manufacturing concrete brick at once.

The New Jersey Cement Block Company, Newark, N. J., recently incorporated, capital stock, $125,000. The incorporators are Bernard Schweitzer, L. W. Crosby and Celia Colton.

One of the new incorporations in the building supply manufacturing industry is the La Tuque Cement Brick Co., Ltd., La Tuque, Que., Canada, capitalized at $30,000, to manufacture concrete products.

Badger Hydro Stone Co., Milwaukee, Wis., has been incorporated with a capital of $25,000, to manufacture a concrete block. The incorporators are P. O. Powell, F. J. Jennings and A. A. Eggers.

To help supply the big demand for building materials and thus supplying homes for the many now anticipating building, the Toronto Cement Products, Ltd., with head office at Toronto, Ont., Canada, has been incorporated with a capital of $40,000 to carry on the manufacture of concrete products.

Otto Ladwig Block Company, 1622 7th St., Milwaukee, Wis., advises us they will put in some new machinery by spring 1920 and would like to hear from manufacturers of concrete products machinery.

A. J. Smith, Buda, Ill., will move his cement products factory to Kewanee, Ill., and additional equipment will be purchased.

The New England Concrete Products Co., 58 Front St., Worcester, Mass., is erecting a new manufacturing building in the town of Holden, costing $10,000.

Wm. H. Pickering, Spencerville, Ohio, will erect a large addition to his concrete products factory building. Concrete bocks and tile will be manufactured.

The Chatham Cement Tile & Block Company is the name of a new organization in Chatham, Ont., Canada, just incorporated.

Capitalized at $10,000, the Cedar Grove Cement Block Manufacturing & Building Co., Cedargrove, W. Va., has received charter to operate their plant. The incorporators are William Lash, William Beamer, D. W. Edwards.

The Universal Cement Casket Company, recently organized, has so advanced along the highway of progress that it plans a large plant in Buffalo, N. Y. for the manufacture of cement caskets to relieve the condition brought about by the lumber famine which is inevitable all over the country.

New Fischer Lime and Cement Building

A contract for the construction of a $200,000 building for the Fischer Lime & Cement Company, of Memphis, Tenn., was let March 1st to Kaucher, Hodges & Co. E. L. Harrison, is the architect of the building.

The new plant will be located on property bounded by Walnut Street, Linden and Pontotoc Avenues and the Southern Railway. It will be of steel reinforced

concrete and tile walls, and will contain many improvements for the benefit of employes.

In the building will be warerooms, salesrooms, display rooms, a kitchen, dining room and rest rooms for officers and employes. There will be security vaults and the floors will be built to withstand a weight of 1,000 pounds per square foot.

The building will give 125,000 sq. ft. of floor space The office will have 5,000 sq. ft. of space. It will be one of the finest plants for its purpose in the south.

The contractors will start work at once and the building will be under the direct supervision of Mr Harrision, its architect.

Among the features will be its mammoth elevator service and the conveyors for loading and unloading certain materials the firm will handle. The ground around the building is large enough to accommodate more than one set of switch tracks.

The Paver That Makes the Money

The big news in the paving world is the Jaeger Paver which was built to meet the demand that has arisen in present day paving construction, the essence of which is speed with quality—smaller initial investment—greater profit for the contractor. Also, the advantage of utility on general concrete work when there's nothing doing in paving.

Large yardage, easy portability and quick convertibility into a mixer for every job. Rapid loading, fast mixing, quick moves, small crew requirement—these are your demands today. You must have the machine that is profitable whether paving jobs are many or few. The Jaeger Paver meets these demands plus. Its performance on paving jobs in various parts of the country has shown its great speed, strength and economy. It sustains Jaeger reputation.

The Jaeger Paver

What Jaeger Users Say—

York & Studebaker, Greenville, Ohio: "It affords us considerable pleasure to inform you that we think your Paver is one of the best pavers on the market. It has the most perfect system of mixing, can do it faster than any mixer we have ever obtained, and can do it to perfection. We mix two bags at all times, and lay as much as 345 feet per day, and at no time run a full day. We cannot speak too highly of your Paver."

F. S. Streever Construction Company, Ballston Spa., N. Y.: "We have used your No. 911 S Jaeger Mixer with pouring outfit and found it extremely well suited to the various conditions found both in new work and in repairing old.

"We have been able to bridge a considerable distance from the mixer to the location of the concrete to be placed and have also found other uses than those you advertise as you will note by the picture sent you showing the pouring of a concrete stair tower 60 feet from base to roof."

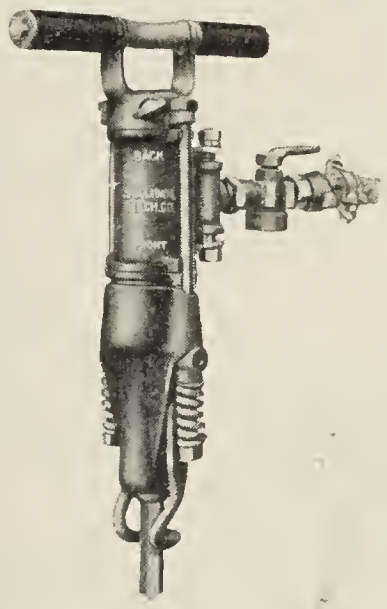
Write the Jaeger Machine Co., 212 Dublin Street, Columbus, Ohio, for their latest circular giving prices, illustrations and other valuable information.

Rock Drilling, Light or Heavy, Sullivan Rotators Successfully Used .

The line of rock drills made by the Sullivan Machinery Company, 418 Gas Bldg., Chicago, embraces machines for every class of service.

The Sullivan Rotator may fairly claim to be an "all-round" rock drilling machine. Since its introduction as an improved type of hammer drill, its use has rapidly extended to nearly all kinds of rock drilling work, including block holing and cutting hitches; shaft sinking, and a great variety of down-hole drilling; drifting, stopping and even light tunneling; work in hard and soft rock, ore and coal, in quarries and mines, in road grading, in sewer trenches and in heavy open-cut work. The Rotator is a one-man hammer drill weighing 40 lbs. It is equipped with automatic steel rotation, is built in separate air and steam types, and may be used as a hand tool or on a mounting. Rotators drill holes from 8 to 12 ft. deep for 1¼-in. powder, and are available in several models, to suit varying conditions.

The "Rotator" in its present form was not placed on the market until 1913, although a Sullivan hammer drill with automatic-bit rotation was used in the Vermont granite quarries as early as 1906.



The All-Around, One-Man Hammer Drill for Rock Drilling. Insures Rapid Progress and Low Cost of Labor and Power

Advantages claimed for the Sullivan Rotator are automatic rotation of drill steel, air or steam operation (in separate types), drill steel retainer, automatic lubrication, automatic ejection of cuttings from drill holes, cushioned return stroke, adaptability to use on mountings, simplicity and convenience, drilling speed and power, strength, stability and low upkeep cost are a few of the advantages claimed.

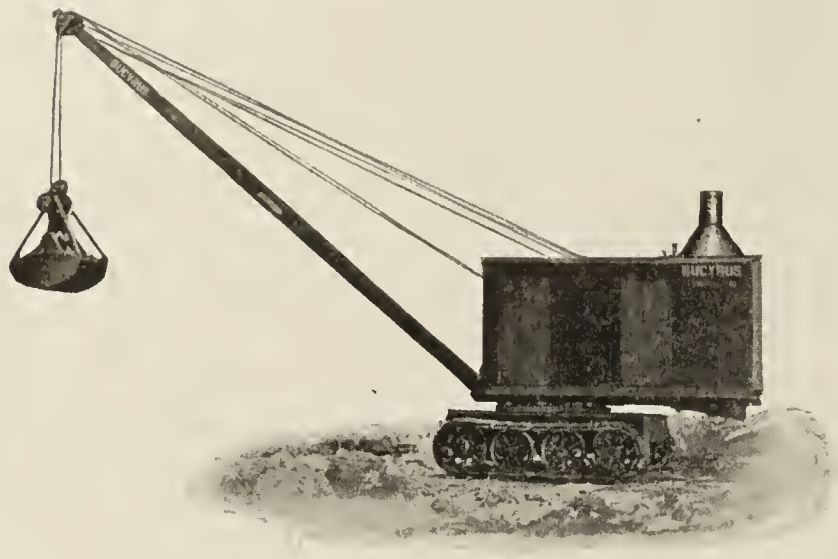
The Bucyrus Company Announces a New Shovel

May Also Be Used as Crane or Dragline

The Bucyrus Co., South Milwaukee, Wis., have recently announced a new revolving shovel, known as the 30-B, which supersedes their 18-B 7/8 yard revolving shovel.

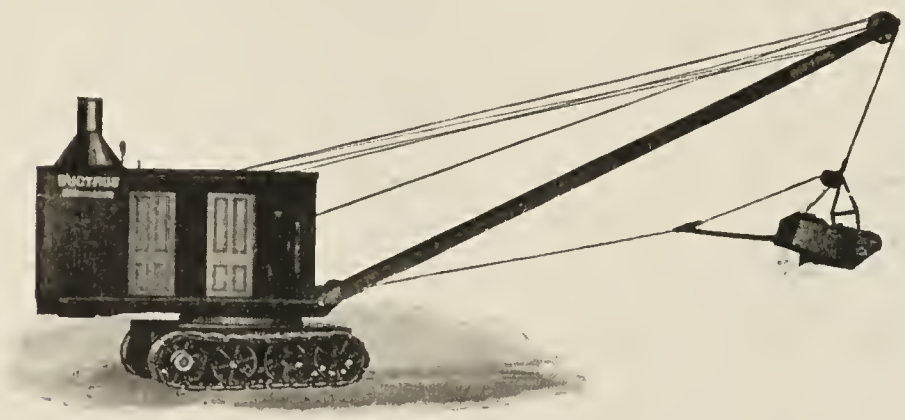
The 30-B is in fact a universal machine, inasmuch as it may be used as a revolving shovel, or with the addition of a few extra parts, as a dragline excavator, a clam shell excavator, a locomotive crane, sewer shovel, or with long boom and dipper sticks for work requiring unusually high lifts. It is so designed that these changes may be made with the minimum of labor, delay and expense.

In designing a steam shovel to combine so many



Used as a Clam Shell

features, there has always been the danger of attaining this universal scope of usefulness by sacrificing somewhat the power, the speed or some other necessary functions which are essential for a machine built solely for any one of the above mentioned combined purposes. For instance, it has always been difficult to combine a revolving shovel into a dragline excavator without attaining this feature at the expense of the digging power of the machine when employed as a dragline excavator. After a thorough study and exhaustive tests, this problem has been successfully solved by the Bucyrus Company and the 30-B is offered as a ma-



Used as a Dragline Excavator

chine which is 100% efficient in any of the above mentioned functions.

As a Revolving Shovel

As a revolving shovel it carries a 1-yard dipper struck measure. When heaped up, this capacity is about 1¼ cu. yds.

Its truck frame is so designed that it will accommodate caterpillar traction, traction wheels or railroad trucks of any gauge from 3 ft. 3 in. to 5 ft. These three mountings are absolutely interchangeable. Such a change can be made in the field at a very small expense. The working weight of the 30-B shovel on caterpillars is about 34 tons, on traction wheels, 31 tons, and on railroad truck 29½ tons.

In weight and power, it is an ideal shovel for the average run of contracting work, basement and road excavation. It has sufficient ruggedness and possesses ample power for work in clay pits, rock quarries, for mining and stripping operation and in fact for almost any class of work ordinarily encountered by a shovel of this type.

As a Clam Shell Excavator

Any user of excavating machinery is aware of the value of a revolving shovel which may be equipped with a clam shell bucket and long boom for loading and unloading material and for many other classes of work. The 30-B will carry a 1-yard clam shell bucket with a 35 ft. boom or a ¾-yard clam shell bucket with a 40-ft. boom. All the change required in this installation is an additional drum on the main hoist shaft with the necessary brake, clutch, thrust cylinder and operating levers, additional ropes, boom, bucket, tag line and trolley. The changes are simply and readily made.

Used as a Revolving Shovel

As a Crane

As a crane the 30-B has a capacity of 9¾ tons at 20 ft. when mounted on caterpillars and 9 tons at the same radius when mounted on trucks or traction wheels. To make this change, the same parts are required as for the clam shell machine, with the addition of the hook.

As a Dragline Excavator

To make this conversion, the same changes are required with the exception that the tag-line and trolley is not necessary and a fairlead, drag-bucket and rope must be ordered. The 30-B dragline supersedes the Class 7 Bucyrus dragline excavator, so long a favorite among contractors and mining companies. It carries a 1-yard bucket on a 35-ft. boom, or as optional a ¾-yard bucket on a 40 ft. boom. The caterpillar mounting is recommended but other types may be used, if conditions require.

As a Sewer Excavator

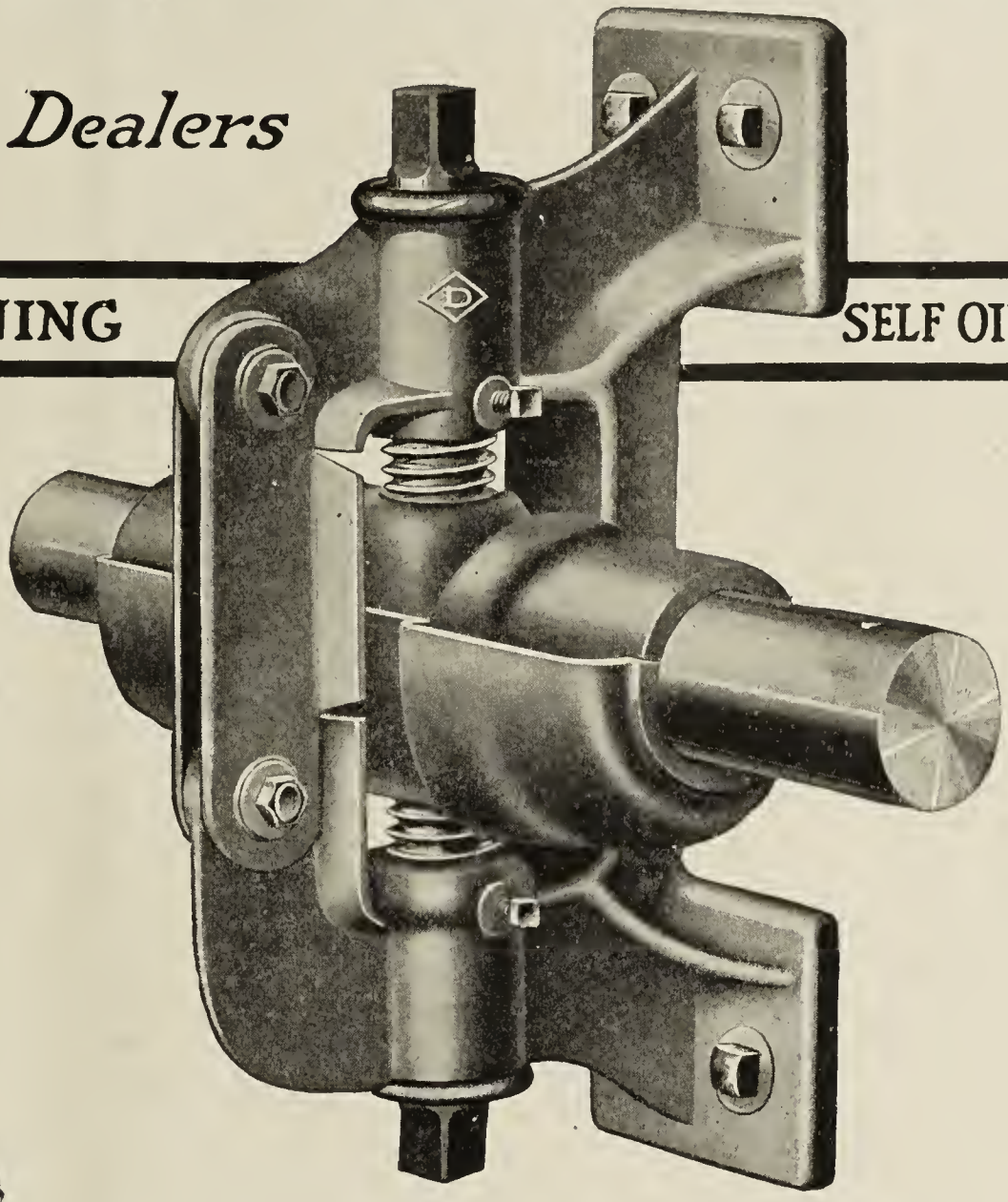
The conversion to a sewer shovel is simple. Two combinations of dipper handles are offered. With a 30 ft. handle it will dig a trench 20 ft. deep and with a 24 ft. handle a trench 14 ft. in depth. It carries a

Dodge Post Hangers

ADJUSTABLE BALL AND SOCKET TYPE

Sold by Dealers

SIDE OPENING **SELF OILING BEARINGS**



Dodge hangers are designed to eliminate, as far as possible, vibration and friction. They are the very foundation of a "roadbed for power." The ball and socket fitting insures alignment of the bearing with the varying motion of the shaft. The side opening makes the millwright's work easy and permits accuracy of erection.

You will find a complete stock of hanger and bearing line at your dealer's—order from him direct at a delivered price.

DODGE

Dodge Sales & Engineering Company, distributor of the products of the Dodge Manufacturing Company and the Dodge Steel Pulley Corporation. General Offices: Mishawaka, Ind. Works: Mishawaka, Ind., and Oneida, N. Y.

Canadian Plant: Dodge Mfg. Co., of Canada Ltd., Toronto and Montreal

Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark

special ¾ yard sewer dipper, although it may be noted that the standard steam shovel dipper may be used for this purpose when the sewer work is not extensive. It may be seen from the photographs that this dipper has no bail, the padlock being pin-connected directly to the dipper-back and the side frames being eliminated. This gives an unobstructed cutting edge with the corners, as well as with the front of the dipper.

For High Lifts

It often happens that a contractor desires an exceptionally high lift and reach as his work may require loading wagons from deep excavation or for special work of some character. To fulfill this demand, a 26 ft. boom and 17 ft. handle may be purchased.

New Features

The design of this shovel contains a large number of new and improved features, based on many years of experience with all types of excavating machinery, in every description of work. These features embody an extremely rigid construction throughout, an improved steam plant, engines and machinery firmly anchored and so arranged that they may be easily taken care of a simplified operating lever arrangement, and careful attention to details such as convenience and ease of operation, accessibility and a great reduction in the number of working parts.

..Caterpillar Traction

The Bucyrus Co. has always maintained that caterpillar traction is the logical mounting for all small and medium sized shovels and dragline excavators and emphatically recommends that the 30-B be purchased thus equipped for any work, except that which requires a very small amount of moving about and a spasmodic output.

Caterpillar mounting for excavating machinery is not a new thing. The Bucyrus Co. is the first manufacturer that has attempted to thus mount heavy excavating machinery and for many years has profited by the field experience of a large number of steam shovels and dragline excavators thus equipped. This type of mounting has been so succesful that it is now an exception that a small shovel or dragline is sold with any other type of mounting. The saving of time and labor effected is exceedingly great. It makes it possible for a shovel to move readily from one part of a job to another without calling upon the services of a large number of pit-men to lay planks and to prepare the way. It enables the shovel to do a small amount of excavation in one part of the job and then to quickly move to another and dig there. It may back away from blasts without loss of time and it can operate in flooded pits where ordinarily the entire plant would be idle. Furthermore, it can travel over muddy ground and climb steep grades with the greatest ease.

The 30-B caterpillar mounting has no complicated side frames. It is to be noted that the use of chains in the driving mechanism has been completely eliminated. Driving is accomplished through direct gearing. The treads are entirely of cast steel with a large smooth bearing surface, enabling the machine to travel over city streets, pavements and finished roads, without any danger of damaging the road surface and allowing extensive operation over rough ground without the continual necessity of renewing treads. The elimination of the caterpillar frame not only adds to the simplicity and the strenth, but permits easy access to the rollers, links and tumblers for purposes of inspection and maintenance.

The machine may be turned easily in its own length and possesses high tractive power.

The manufacturers have recently isued Bulletin No. C-301, describing the 30-B in detail.

Hendricks' Commercial Register of the United States for Buyers and Sellers 28th Annual Edition 1919-1920

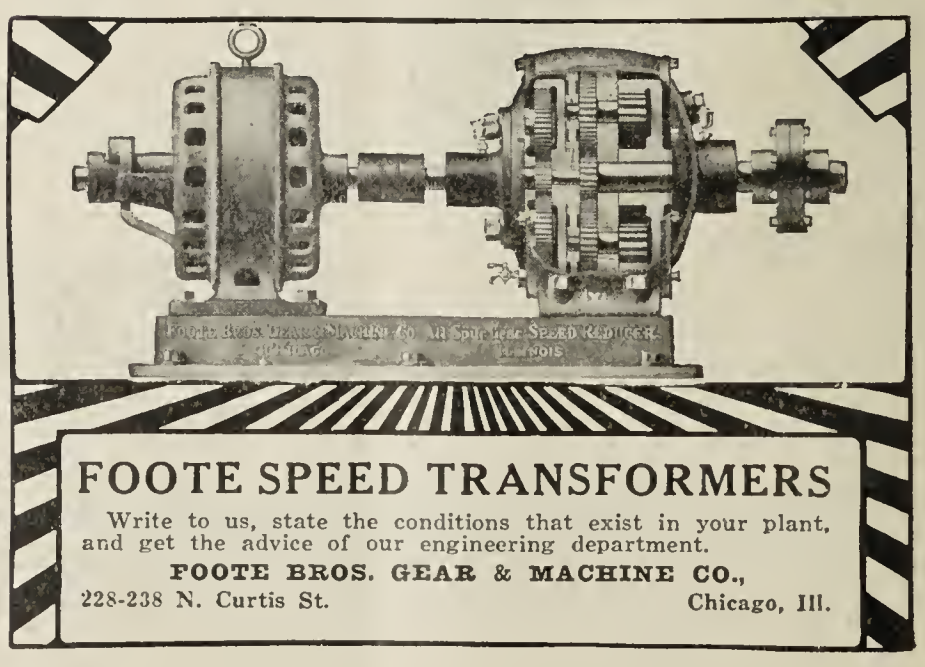
S. E. Hendricks Co., Inc., New York, $12.50

The 28th Annual Edition of "Hendricks' Commercial Register of the United States for Buyers and Sellers for 1920 has just been published, after being delayed for two months by the strike of the printers in New York. It is published by the S. E. Hendricks Company of New York at $12.50 The new edition contains several improvements. The most noticeable being the new method of exterior indexing by coloring the front page red, white and blue to indicate the different main sections of the book.

First is blue on which is stamped the words "Trades Index." This is a section of 162 pages in which every product listed in the book is indexed and cross indexed for ready reference. The red section is the main classified trades list. It contains 1,813 pages listing over 18,000 difierent products. In the present edition we find over 1,200 new headings, including many headings completely covering the chemical industry. The third section of the book as indicated by the white edges, contains 216 pages listing the trade names under which products are manufactured, with the name and address of the manufacturer. The second blue section is the Alphabetical section of 487 pages containing all the names in the book in one alphabetical list with addresses, and their main line of business. This is followed by the index to advertisers of 20 pages, containing a full list of branch and foreign offices following each name. The whole book making a volume of 2,703 pages.

It is an excellent work, a copy of which should be in every sales and purchasing department. For the former it contains complete lists of all prospective customers and for the latter it shows at a glance the producers of any product which may be required. The list of trade headings covers from the raw material to the finished article all products connected with the Electrical, Engineering, Hardware, Iron, Mechanical, Mill, Mining, Quarrying, Chemical, Railroad, Steel, Architectural, Contracting and kindred industries, and the firms listed cover Producers, Manufacturers, Dealers and Consumers.

"Hendricks' Commercial Register" has been published annually by the S. E. Hendricks Co., Inc., exclusively for 28 years. The publication of this important reference book involving a tremendous amount of detail work in compilation and annual revision places before purchasing agents sales managers a fund of valuable information not heretofore available.


FOOTE SPEED TRANSFORMERS
Write to us, state the conditions that exist in your plant, and get the advice of our engineering department.
FOOTE BROS. GEAR & MACHINE CO.,
228-238 N. Curtis St.
Chicago, Ill.

Cement and Engineering News

Vol. 32 Chicago, May, 1920 No. 5

Time Ripe to Push Concrete Coal Pockets

Coal Dealers have gone through a sweat this season, due to car shortage, coal shortage, labor shortage and high prices of everything. The dealers without storage bins wish they had some. The dealers without labor wish they had automatic gravity coal pockets which would make them independent of labor conditions.

The railroads and Interstate Commerce Commission are co-operating to keep cars moving by boosting demurrage charges to a point where three or four days' delay will hurt. Hundreds of dealers have had big demurrage charges this year simply because it was impossible to get them to unload the cars.

The dealer who has plenty of bin room can buy his coal and store it early in the spring and can acord to hold it till the prices advance in the fall.

Silo building equipment is just what is needed for putting up coal pockets. The walls have the same thickness and the construction is the same but for changes in the reinforcing. There's no time like the present to make this proposition forcible to the coal dealers. Remember, too, that the building should be completed early in the summer, so it is wise to get these jobs lined up now. Strike while the iron is hot.

There has never been a time for many years when coal dealers have been so pressed for coal as during the present season. Those dealers who have carried large stocks are fortunate and are being well paid for having additional storage facilities.

The elevated automatic coal handling plant makes the dealer independent of labor conditions, saves from 30 to 35 cents a ton on all the coal handled and makes possible the most economical buying on account of the storage facilities of the plant.

New Uses for Silo Forms

Ten years ago there were but few contractors in this country who were equipped with steel forms for building circular structures. Here and there a contractor rigged up a special form for round concrete grain bins, which were growing in favor for the large terminal grain elevators, built chiefly by the railroad and grain companies. About the same time the silo came into popularity in the middle west, and was seized upon as a profitable field for concrete construction.

The contractors who had steel forms adapted them readily to silo construction and straightway numerous equipment manufacturers set to work to develop molds. In a few short years many acceptable silo machines were on the market, and there are over a thousand of them now in use in the central part of this country.

There is no need as yet for contemplating the point of saturation in silo building, as the farmers have only begun to build. The silo building business will be flourishing for several generations, and in fact may never be done, as the intensity of farming must increase with the population. Many contractors, however, are taking advantage of the adaptability of silo forms to other classes of work. Among the other uses for silo equipment are the building of water tanks, stand pipes, grain bins, grain elevators, ash containers for industrial plants, elevated pockets for ore, gravel, stone, sand and coal, oil tanks, coaling stations for locomotives, coal tipples for mines, etc.

These are not merely suggestions, as already there are several examples of these diversified uses for silo building equipment.

Permanence Demands Concrete Pipe and Tile

While concrete pipe and tile has been in use in land drainage for a good many years, it has only been for the last few years that their use has become general. Always true to shape, they are easy to lay with close joints so that earth will not get into the tile line and clog. Another point in their favor is that they will not disintegrate under frost action.

Concrete tile drains may be laid to steeper grade than open waterways, because a tile line furnishes a permanent channel that prevents water from washing away the soil; in fact, the increased grade possible with underground drains causes the water to flow from the soil more rapidly.

A CORRECTION

F. L. Smidth & Co., engineers, New York, N. Y., call our attention to an error on page 28 of our April issue in which they are reported as the engineers who designed and built the Western States Portland Cement Company's plant.

"It is only fair to the designers and builders of the mill as well as to the officials of the Western States Company that you make public correction of the error and we also desire to see the proper persons given credit therefore," writes F. L. Smidth & Co.

We regret this mistake occurred and we are glad to give the proper persons credit. This plant was built by the late W. F. Cowham, president of the Peninsular Portland Cement Company, Jackson, Mich., who also organized and built the Northwestern States Portland Cement Company's plant in Mason City, Iowa, and the Southwestern States Portland Cement mill at Dallas, Tex. Mr. Cowham organized his own engineering staff under the name of the Cowham Engineering Co., Jackson, Mich., whose chief engineers were Mr. Bogardus and Mr. N. J. Maytham, who supervised the erection of the above mentioned mills.—*Editor.*

Decorative Possibilities of Concrete

The public is gradually awakening to the fact that objects of an artistic nature can be made of Portland cement concrete. The adaptability of the material to utilitarian purposes, its widespread use in massive foundations, bridge piers and abutments, and office and factory buildings, has had the effect of making those who saw it almost exclusively in this type of construction think it unsuited for finer craftsmanship. Some of the earlier "ornamental" concrete work did a great deal to confirm this erroneous impression. Indeed, in many parts of the country today little or none of the concrete work would excite admiration as an artistic effort. In other sections, however, and notably in California, the development of ornamental concrete which is really ornamental and artistic has been great. Results have been achieved which even the most critical must admire.

As a matter of fact, concrete is almost ideally adapted to ornamental uses and elaborate designs. Unlike stone, on which the work for a reproduction is as great as on the original, concrete lends itself readily to duplication. It is unlike clay in this respect, also, and in being a cold process throughout, doing away with the necessity for firing. Its comparatively slow setting properties enable it to be placed more carefully and exactly than may be done with plaster or other materials which set very rapidly. Its lasting and weather-resisting properties make it an ideal material for out door ornamentation. This latter is probably one of the reasons why California leads in the development of ornamental concrete, since the climate there makes for elaborate outdoor gardens and parks, for the decoration of which this concrete work is particularly fitted.

The possibilities of concrete in ornamental work are almost unlimited. Properly used, it produces a wonderful and endless variety of artistic effects which will compare more favorably with ornaments made from other and much more expensive materials. The development of flexible molds has made it possible to produce in concrete anything which can be carved in stone, modeled in clay or cast in plaster. Indeed, the reinforcement of the concrete work has made possible some slender designs that could never have been safely carried out in these other materials.

One of the requisites for good ornamental concrete work, as well as for good work of any kind, is properly selected materials. Cement has largely become standardized, so that the question of whether white or gray Portland is to be chosen is the principal one, and that will be governed by the kind of work to be done. Much depends upon the aggregates chosen. By a proper selection of sands and finely crushed particles of different kinds of stone, the surfaces which may be obtained are almost unlimited in variety and many of them are highly beautiful.

The question of workmanship is of utmost importance in ornamental concrete work. Little unsightly places which are no serious defects in mass concrete or building work become ruinous in ornamental work. Great care must be taken to secure a uniform mixture of the right consistency, the latter depending somewhat on the type of mold to be used. For glue or plaster molds, a mixture of the consistency of thick cream should be used; for wood or metal molds which it is desirable to remove as soon as possible, a fairly dry mixture may be used, tamped thoroughly into the mold.

Excellent results have recently been obtained in colored concrete. For this purpose a white Portland cement gives the most satisfactory results except for very dark colors, when the gray may be used as well. By using white sand or marble dust as an aggregate with the white cement and using mineral pigments, almost any desired shade and color may be obtained. These pigments are mixed dry with the cement and aggregate until the whole mass assumes a uniform color, when water is added and the whole mixed into a mortar.

Exhibit of Ornamental Concrete Work.

With the development of the use of concrete for ornamental purposes, no feature of the construction has required so much ingenuity as the molds. The average cement worker has by now become familiar with two kinds of molds, wooden ones which he makes himself and metal ones which he buys. The use of wooden molds is, of course, restricted to those subjects made up largely of planes and easy curves. On this type of subject, with clever carpentry, very excellent results are obtained. The scope, however, is necessarily somewhat limited.

With metal molds, practically any shape which has no undercutting may be successfully cast, but the difficulty lies in securing the molds. These can, of course, be purchased from manufacturers in many different shapes, and excellent results secured, but on original work the necessity for special castings makes the cost prohibitive.

Two other types of mold have been developed and are used with great success, the plaster mold and the glue mold. Each requires that a model of the desired ornamental concrete object be prepared. This model may be of any hard and substantial material. The plaster mold is inflexible and cannot be used for undercut work. For any other type, however, it has the advantages of being lasting, if carefully handled, and of being made cheaply, easily and without special apparatus.

The glue mold is really what has made the most elaborate forms of concrete work possible. On account of its flexibility, the glue mold may be used on an undercut or any other kind of model with success. It is not permanent, as only from 6 to 8 pourings can ordinarily be made from one mold, but the material can be remelted and used again with little trouble. It is comparatively inexpensive also.

Quarried stones and marbles stand today in keen competition with cement. The odds are beginning to favor the factory-made stones as the cement technique develops. Plain drab and grayish artificial stone, with the advantages of durability and cheapness, has displaced, in large part, the use of natural stone and brick in the construction of buildings. With the production of imitation stone and marbles, cement is entering into the new field of palace and temple composition.

Finely veined, granulated, white, colored and varicolored marble surfaces, faithfully true in detail to the marbles imitated and capable of taking high finishes, are found among the wares of the modern cement factory. Parian marbles can be made in Pennsylvania as well as quarried on the Isle of Paros.

In the production of artificial sandstones, granites, marbles and mosaic work, the whole technique of the cement worker is tested. He not only has to mix a durable stone, but has to incorporate coloring stuffs, veinings, marble patterns and granulated surfaces, all of which must be able to withstand the action of water, heat, frost, acid and salts. The polished marble surfaces must wear as well as natural stone. The roughened surfaces must be more resistant than the quarried sandstone.

Granite imitations are finding wide employment in this country and a still more widespread use in Europe. They are used chiefly in the construction of large buildings and homes, and as sidewalk slabs, monuments and tombstones. Cement granites are close copies of natural stone. They have high supporting strength; are waterproof, and can be produced far more cheaply.

Much of the beauty of granite is owing to the sparkle of its quartz crystals and glitter of the mica corns which enter into its composition. The quartz crystals are sometimes white, sometimes greenish, often bright as water prisms and, again, like frosted glass, but always sparkling. The mica flakes are black, with a metallic sheen, and are sown thickly through the stone. Both the effect of the quartz and the mica must be retained in the cement granite, which, as are the natural granites, are produced in three colors—white, red and green.

The great body of the artificial granite is, of course, the cement. This is mixed thoroughly with pigment, if green or red granite is to be manufactured. To obtain the sparkle of the quartz crystal, a fine-grained quartz sand is used. Mica is mixed with the mass to produce the sheeny, black flaking. Admixture of too great a quantity of mica not only colors the whole surface of the stone black, but weakens the resistance of the finished stone against frost. A popular delusion which has ensnared many a handy man is that cement granite, as well as the other imitation stone varieties, may be successfully and cheaply produced in a temporary backyard plant, according to the general technique of handiness. This overconfident assurance is responsible for the occasional bad repute of imitation stone.

Mica is relatively dear. In the cheaper imitation granites its place is taken by dark blue or green glass fragments, by black marble waste and by ground granite. The deeply colored glass fragments give a very good mica effect, shining with the bright metallic sheen peculiar to the mica flakes in the quarried product. The use of marble is less satisfactory, as it has a great capacity for water absorption.

As coloring matter, iron oxide colors or colored stone ground to a fine meal are used. No earth or aniline colors can be used, or colors with lead or sulphur contents, as they destroy the cohesive strength of the cement. By the use of inferior or unadapted coloring substances the weathering qualities of the finished stone are so impaired that heat, frost and rains soon wear it away. If the surface of the imitation stone is finished carelessly, left in a porous condition, it soon acquires a disagreeable dirty appearance.

Of the sandstones, the red, yellow and gray are made artificially of cement. These are used almost entirely in building construction, the artificial sandstone largely taking the place of the natural article in the building of frame house foundations, stone porches, in trimmings and in house fronts.

Fine and middle-grained sands of white, gray, yellow or red color are mixed with the cement, together with slight quantities of pigment, for the manufacture of sandstone. Even the blemishes of the natural stone are imitated in dark colored spots and veins. The dark patches are made by a sparing use of graphite, while the rust colored stripes are produced by strewing iron filings, mixed with iron vitrol, upon the first layer about one-quarter of an inch thick, in the stone form.

Both the artificial sandstones and granites are worked freely with mallet and chisel. They are embossed in all patterns usually seen in the natural stone facings, either by the use of the chisel after manufacture or so stamped in the original forms and later roughened with the chisels. The cement sandstone is much more easily worked than the imitation granites.

Mosaic cement work is probably the most artistic phase of the art stone industry. It is used almost exclusively in flooring, interior and terrace flooring, although some employment for cement mosaic has been found in this country and Europe in interior paneling. The cement mass for mosaic patterns is prepared and colored in much the same way as the imitation stones. They are worked into all manner of patterns and figuring. The separate stones are stamped and formed by machinery. Some of the dearer qualities contain mother-of-pearl, serpentine, colored glass and mica splinters.

Production of cement marbles is still in its beginnings. While perfect imitations, with delicate veining and coloring, capable of taking high polishes and displaying the rich depth of surface of natural marbles, are made, there are many capable cement workers who regard the manufacture of imitation marbles as a species of pretty toying. It is claimed that the imitation marbles are not able to resist weather disintegration. Much of this cement work is used in interior wall paneling in clothing pillars and in other kinds of inside decoration.

Long Span Concrete Construction

What is known as "practice" in concrete building construction today has arisen from the usual solution of past problems. This "practice" explains the reluctance on the part of many to even consider new or unusual types of construction and therefore tends to restrict the development of methods having promise of great economy and usefulness. The simple concrete girder having steel in its lower portion to take tension stresses, together with bars, either vertical or inclined, near the ends to take shear, is that with which we are most familiar. A depth of a few feet at most with a width in proportion, is what we are accustomed to, and whenever it is proposed to construct an unusually large concrete beam or to use some form other than the ordinary rectangular or T-beam section, the conservatism encouraged by "customary usage" immediately raises its hands in protest regardless of whatever merit or economy the proposed practice may possess. As a matter of fact, no span within the limits of those used in ordinary factories, garages, theaters and public buildings should ever be credited with being too great to be compassed by reinforced concrete without full investigation. Often it will be found that by slight departures from the usual type of simple or continuous concrete beam construction a design can be evolved which will be more economical than in any other material.

The Anderson garage, Social Hall Avenue, Salt Lake City, Utah, shown herewith, uses reinforced concrete for long spans. This building was constructed by Villadsen Brothers, Engineers and Contractors, Salt Lake City, Utah. The garage is one of the Social Hall Avenue group of concrete buildings, all of which were planned by Miller, Wooley & Evans, Architects, Salt Lake City, Utah.

Fifty-foot span roof arches in Anderson's Garage, Salt Lake City, Utah, showing that concrete can be used successfully in long span roof arches.

Seventy-foot arch span in foundry building of Garfield Smelting Co., Garfield, Utah.

The roof supports of this garage were designed as rigid frames. Advantage is thus taken of the greatly reduced moment at the center of the span by virtue of the fixity of the arched girders at the column tops. This, of course, introduces bending moments not only in the girders but in the columns as well. The same general type of roof construction was used for the foundry building of the Garfield Smelting Co., at Garfield, Utah, excepting that in the latter there are two columns instead of three as in the garage.

While the processes of computation in the design of such structures is slightly more complicated than for simple beams, the principles underlying them are clearly set forth in technical literature and should present no obstacle to a designing engineer. In fact, in Europe the design of rigidly framed structures is very common.

In constructing the bents of the foundry building, the forms for both the legs and arched girders were assembled on the ground and hoisted into place with a stiff-leg derrick, the reinforcing being all in place before hoisting. The same forms were used eight times, thus obtaining low cost and enabling the work to proceed without interruption or obstruction of the work rising from assembling forms in place.

It is important to note that this design in reinforced concrete was selected as being low in first cost, possessing high fireproof qualities, offering large lighting area, enabling completion in the shortest possible time and producing a structure on which maintenance is practically negligible.

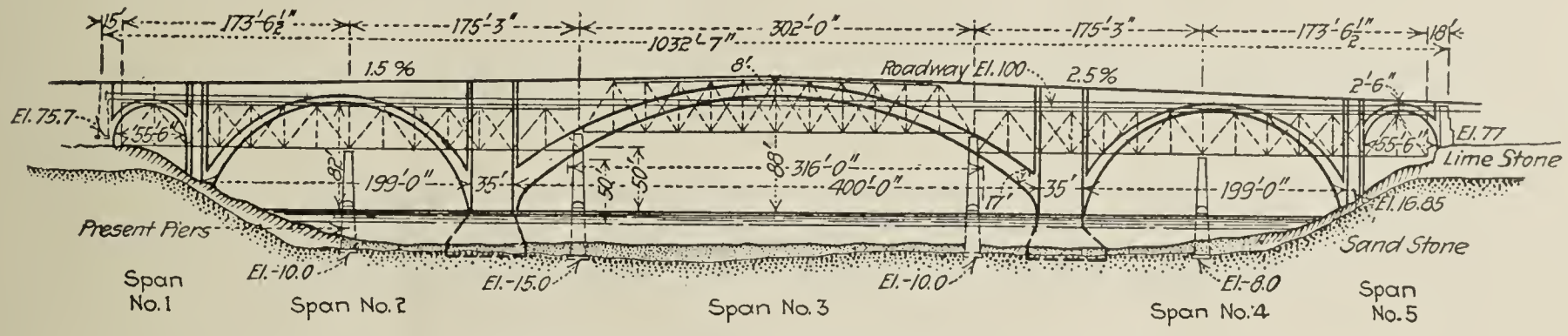
All About Chains

"Chains, a Book of Information," has been issued by the Columbus McKinnon Chain Co., Columbus, O. It presents briefly full data concerning the chains made by the company for various industrial purposes, these facts including comprehensive tables that will be found very useful. Not the least valuable feature of the weight, bulk, etc. The company will send a copy to book is a table of metric equivalents as to length, anyone on request.

Longest Concrete Arch Span Being Built at Minneapolis

400-Foot Span of Franklin Avenue Bridge Across Mississippi Surpasses By 62 Feet the Record Risorgimento Arch Across Tiber at Rome

A 400-foot concrete arch, which will be the longest-span concrete arch in the world, is being built at Minneapolis, Minn., constituting the main portion of the Franklin Ave. bridge over the Mississippi. It will consist of two separate ribs of 400-ft. span between faces of piers, with a rise of 88 ft. above the springing line, at high-water level. The main arch is flanked at each end by one arch with a clear span of 199 ft. and one of 55½ ft., the total length of the bridge over abutments being 1,032 ft. The piers will rest on the solid rock of the river bed. Each rib of the main arch will be 12 ft. wide, with a thickness of 17 ft. at the springing line and 8 ft. at the crown, carrying spandrel columns with cross-girders to support the concrete deck. The rib reinforcement consists of frames, 6x6x½-in. angles being used in the large span and smaller angles in the approach spans. The ribs are



FRANKLIN AVENUE BRIDGE ACROSS THE MISSISSIPPI AT MINNEAPOLIS WITH 400-FOOT REINFORCED-CONCRETE CENTRAL ARCH

on either side of the present steel truss bridge, which thus affords facilities for the construction work. The 400-ft. span was necessary to give a clearance of 50x300 ft., as required by the United States government for navigation purposes.

The present steel bridge is being used for traffic, as well as for construction purposes. Its roadway is 18 ft. wide, so that by the removal of the sidewalks the new arch ribs, placed 25 ft. apart, will clear the steel work, which will be removed when these ribs are completed, the floor for the 25-ft. space between them being placed after the removal of the old structure. This floor will be cast ashore and will be placed by a traveler from the completed floor over the arch ribs.

Work was commenced in June, 1919, on the work and concrete-mixing plant, located on the Chicago, Milwaukee & St. Paul R. R. tracks in southeast Minneapolis, about 2,000 ft. from the east end of the bridge. The material will be handled by a conveyor system, and service between the bridge and the plant will be performed by two gasoline locomotives on a 36-in. track. This plant is nearly completed.

In July the cofferdam framing was commenced on a flat piece of river shore about one-half mile up the river from the bridge site. These frames were then floated down and placed in position for pier No. 1. This cofferdam will be 80 ft. up and down stream, and 64 ft. wide, divided into two compartments 40x64 ft., by 28-ft. 14-in. arched steel sheet piling, which also will surround the entire cofferdam. This pile driving has been completed for the downstream compartment. The piles are driven through boulders, gravel and limerock débris to and into the underlying sand rock. Excavation with a camshell bucket was commenced before the pile driving was finished.

The general design of the bridge and the design of the great arch span were made by F. W. Cappelen, city engineer. The city is doing the construction by its own forces. Contracts have been let for the arch reinforcement. The construction of falsework for arch No. 2 has been commenced, and it is planned to work through the winter. It is expected that the bridge will be completed in 1921 at a cost of about $500,000.

New Standard Testing Screens by the United States Bureau of Standards

The United States Bureau of Standards has promulgated a very complete series of standard screens for screen tests of all kinds. This system of screens was adopted only after wide conference with makers of screens and with those using screens for many different purposes.

The new system of screens have a wide range in size of the mesh, and the individual sieves are sufficiently numerous to provide for any conceivable need for either a few or many sizes of sieves definitely related to each other.

Each sieve has a size of mesh bearing a definite and uniform mathematical relation to the screen next to it, both smaller and larger in size.

Each screen has an identification number. The screens are rated by the size of the openings. The openings are based on the metric system but most of the screens are readily convertible into equivalent English units.

Specifications are laid down for the relation of wire diameter to size of mesh and the general dimensions of sieves.

All persons doing sieving or making screen analysis should as rapidly as possible conform to this new standard system of screens, because of the advantages of better distribution and easier and more systematic interpretations and comparisions of results.

These standard screens have a very special significance in the cement and lime industries where so much depends on fineness of material.

Full description and specifications for the new system of screens may be secured upon application to the U. S. Bureau of Standards, Washington, D. C. The Bureau is prepared upon application to test and seal testing sieves for a small fee.

The Business of Making Concrete Roofing Tile

BY D. HELMUTH

President and Manager Empire Tile Company;
President, Concrete Roofing Tile Association,
Cleveland, Ohio

In 1914 while in the construction business, I had numerous inquiries from clients regarding ornamental roofing tile to be used in conjunction with other fireproof materials in the construction of medium priced homes. It was quite evident there was no tile suitable for the purpose other than clay tile, which of course, was prohibitive owing to the high cost, and from the fact that these tile were made in one color only.

Experienced and interest in the question caused me to do considerable thinking, and I wondered why so little thought had been given to the beautifying of the roof of a moderate priced home, and why no decorative concrete or other tile of medium price had been developed. I began further investigation and finally located a small concrete roofing tile plant in the East, in which they were making roofing tile in a crude manner on machinery brought from Europe. While there, I obtained sufficient tile for one roof of a color desired.

After seeing the tile, I then discovered a discrimination among the roofers against applying this product, and was forced to lay the tile myself. After the contract was completed, and noting the artistic effect secured, and the comments of architects, contractors and home builders, I decided to order more of this type of roofing material; and before I realized it, I had placed orders for 67 car loads of this roofing tile for work in Cleveland, Ohio, alone. The ready sale of the tile and the pleasure of satisfying my customers, caused me to decide upon entering the business of making tiles of colors which I knew to be both pleasing to the eye, permanent in character and fireproof in structure.

My first problem was to secure machinery adapted to the making of a high-grade tile and with the necessary parts to enable me to make special shapes, so that the plant would be equipped to make any form required to complete the roof. On looking over the field of machinery manufacturers, I failed to find an equipment on which I could produce tiles and shapes, complying with the city building code, and that would pass the judgment of high class architects. Knowing full well what I was up against, and believing improvements in machinery and equipment would come, I contracted for some of these machines, which arrived in just the condition I expected they would come. However, I went ahead and did all I could do, to place the equipment in shape. We began to manufacture the tile only to find we were compelled to purchase and make additional equipment, at an expenditure three times that of the original contract for the complete roofing tile equipment. After securing this additional equipment we discovered the tamping bars used in making the tile entirely too rough and caused considerable trouble and expense. However, we finally got started and made some 50,000 tile, which with changes in machines and persistent effort on our part, proved to me conclusively that with further experience we would meet a success which would warrant the labor and money to be expended.

It became necessary, also, to work of our own plans and specifications for applying the tile as well as the metal work used in connection with the tile; this I am glad to say has worked out beautifully and in a perfectly satisfactory manner.

The problem of securing permanent colors was then taken up, as the colors represented to us (under a great trade secret) began to fade, causing us further worry, until, after consultation with expert chemists, and exhaustive tests, we have developed four standard permanent colors—red, green, grey and brown, which we have adopted and standardized and are now furnishing the trade.

During the days of early experiments, we continued to receive many inquiries for this product, and though our competitors began criticising the tile we were continually picking up customer after customer. We ignored all critics, and strove to improve both the tile and equipment, and found the enterprising home builders in every section of the city making inquiry for our tile, for the widest publicity was given the product, from the fact of its artistic effect, low cost, fireproof and everlasting quality.

At the beginning of our operations, we were disappointed in the cost of manufacture, as machinery manufacturers claimed we could manufacture the product for $2.50 per square and that these same tile could be sold at from $6.00 to $7.00 per square. We soon found these statements a wild, imaginary dream, whether conscienciously made or otherwise. Upon due consideration, we decided finally to adopt our own methods as to the process and mode of operation of the plant, and began operating upon piece system basis. This was worked out nicely and is both satisfactory to our employes and as well as economical to us.

We believe today that we can truthfully say that the tile industry, if given the usual business care, can be started without the worry and expense to which we have been placed, and as we have covered over 1,400 complete roofs and have orders booked ahead for more than 150 houses, prove conclusively that the material and work which we have placed upon the market has proven entirely satisfactory, so that today we are compelled to turn away good business owing to the capacity of our plant not being sufficiently large to supply the demand. We have concentrated our efforts on labor-saving devices, and through the efficiency of

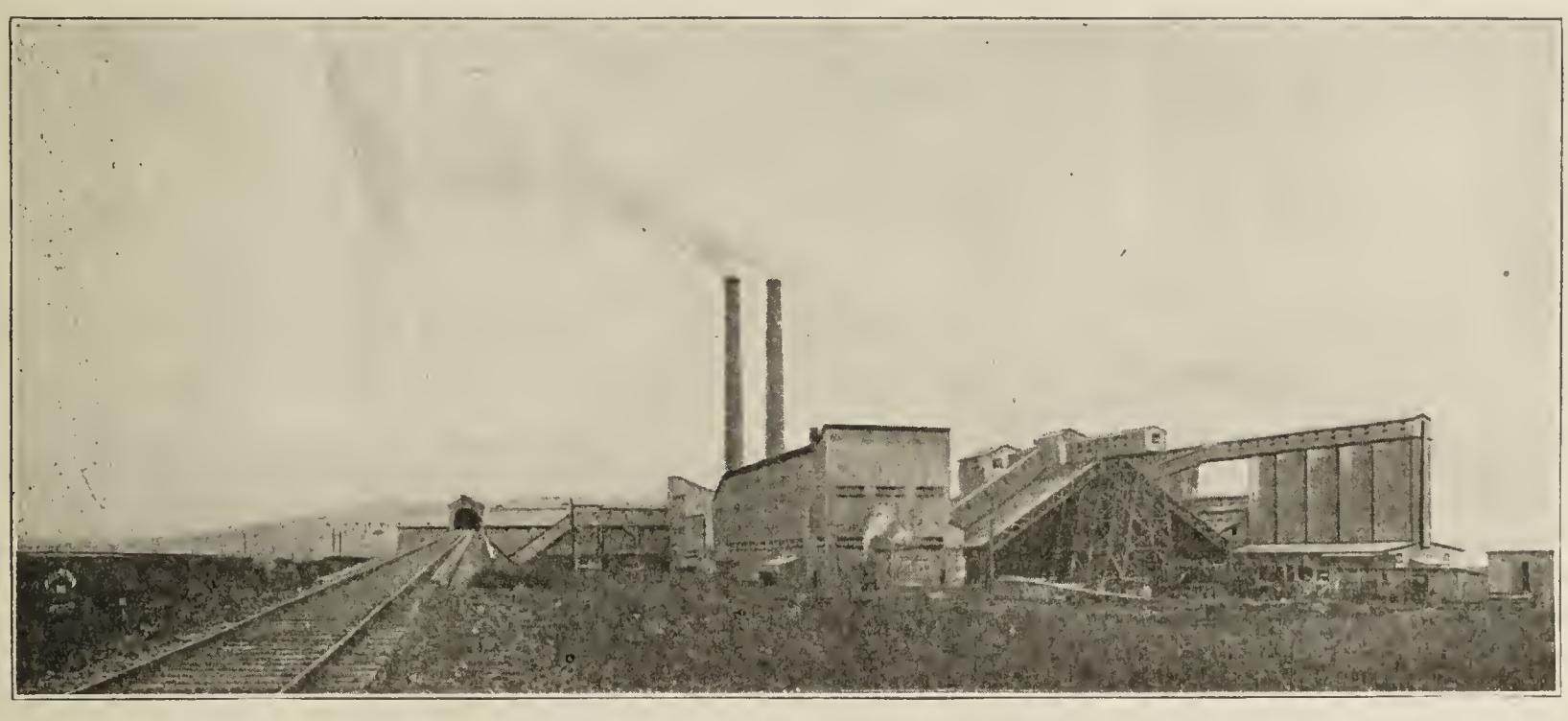
Cement House Covered With Concrete Roofing Tile.

our organization we have increased the output of our machines from 250 tiles each man per day to 600, the size of tile being 9x12¾ inches. We are at the present time making a uniform quality of product of permanent standard colors of a superior quality with which we give the customer a service direct from the manufacturer to complete roof service.

We feel that our efforts are bringing the desired results, we are now fully satisfied with the tile business and prices which we secure warrant us in expanding our business considerably. The fact that homes covered with our tile usually bring from $500 to $2,000 more in profit over the other types of roof to the builders, causes him to become our friend and staunch supporter.

Olympic Portland Cement Co. Bellingham, Wash.

On the bluffs overlooking Bellingham Bay en route to Marietta stands one of the largest and most modern cement plants in the country, that of the Olympic Portland Cement Co. Since it began operation it has manufactured millions of barrels of cement, much of which has been used in the construction of paved roads in Western Washington.



General View of The Olympic Cement Plant.

The wet process of manufacture is used. The plant which was designed and built by F. L. Smith & Company, 50 Church Street, New York, N. Y., operates Smidth Kominuters, tube mills and ball mills and Vulcan Kilus.

The plant has been running steadily ever since November, 1918. In the interval it has shipped 350,000 bbls. During the last 13 months the company has employed 130 men at its factory, in its clay pits at Brennan and at its quarry at Balfour.

Part of the time the plant ran at full capacity and the rest of the time at half capacity. As the full capacity is 2,000 bbls. per day, the output has been large at all times.

President A. F. Krabbe says that the demand for cement has been fairly good throughout the last year and that during the latter half shipments were limited only by the car supply. There is some fear that cement companies will face a similar limitation in 1920. If this does not materialize the exports probably will be heavier than they were in 1919. All the last year's shipments were to points in Western Washington, where millions of dollars have been spent in permanent road work during the last five years.

Before starting operations a year ago, the company spent about $70,000 building a powdered coal mill. This has a capacity of 200 tons of coal per day. The company was led to replace oil with coal because of the high price of the oil and Mr. Krabbe says the change is satisfactory, the coal, which has been obtained from British Columbia, meeting every requirement. Early in December the company's crusher building at Balfour was burned down. This is reconstructed, work starting in January.

The Olympic Portland Cement Co. is admirably situated with regard to supply of raw materials and shipping advantages. Its natural resources are practically unlimited. At Brennan it has extensive beds of clay on which as yet it has no more than made a slight impression. At Balfour it has a mountain of fine quality limestone.

Ohio River Sand Supply

Carl P. Leatherwood, of the Portland Cement Association, Parkersburg, W. Va., is responsible for the assertion that a well-known engineer in that city has compiled figures indicating that the Ohio River from Chester to Kenova, a distance of 273 miles, contains sufficient deposits of sand and gravel to build 45,000 miles of concrete road, 18 ft. wide, 6 in. thick on the sides and 8 in. in the center. The engineer bases his conclusion on the following data:

Distance of Ohio River from Chester to Kenova, 273 miles; average width of sand and gravel bars, 300 ft.; average depth of sand and gravel bars, 10 ft.

Assuming that 50 per cent of the length of the river bed is productive, there would be a yield of sand and pebbles of 80,080,000 cu. yd. While there is no way of checking the engineer's estimate, it is generally admitted, says Mr. Leatherwood, that the Ohio River can produce enough sand and gravel so that not a pound of fine or coarse aggregate need be imported to hard-surface every highway in the state.

Safety Hazards of Cement Industry

Abstract of Address by O. C. Soderquist, General Superintendent Universal Portland Cement Co., Buffington, Ind.

Many of the hazards to safety in a cement plant are so common as to escape notice—employe and employer alike must occasionally see these dangers itemized and have them brought newly to the attention to avoid a feeling of false security that comes from more or less constant association with conditions that jeopardize the safety of employes.

In this a recent address by O. C. Soderquist, general superintendent of the Buffington plant of the Universal Portland Cement Company, serves to itemize cement mill dangers freshly.

There are, for instance, the raw material unloading track hazards, where there is no possibility of the men being properly protected when unloading material; the danger of frozen materials in the winter increases this hazard, the switching of cars, the care of tools, the construction of walks and passageways and the perfect understanding of operating signals.

Men working in the raw material building, at the opening to bins, are very often sujected to many hazards, that of large lumps of frozen material rolling out of the bins, perhaps bruising feet and legs. It is at times necessary for workmen to enter these bins and the danger here of undermining materials, of material on track and structure above which may fall at any time, should not be overlooked.

We next come to crushers and dryers, as well as elevators and conveyors of all kinds. Here we find hazards so numerous it would be impossible to mention them all, for here we usually find gear drives, chain drives, belt drives and others, as well as revolving drums and rolls, and motors to drive them, all of which threaten accidents.

There are the preliminary mills of all types and raw material finishing grinders which have their different styles of feeders, and are far from safe.

In the kiln room we have the slow running kiln, which in itself is probably harmless, but the machinery necessary to drive it, consisting of gears, belts, pulleys and motors, as well as line shafting in many cases are all necessarily placed in locations which tend to make them full of danger, particularly for oilers.

Coal feeders of all types should be looked into with the idea in mind that when the kiln is down for a short period the danger of accidentally starting this feeder may cause an explosion with enough force to blind or burn men who may pass in front of kiln.

In the coal house we have the usual hazards connected with drives of all kinds, as well as dryers, crushers and pulverizing of mills of all types, but of course the great danger here is the possibility of an explosion. The coal dryer discharge should be carefully watched, as it may clog, causing dryer to fill and naturally heat very rapidly, resulting in serious damage.

Our next step is at the clinker pile, which, as a rule, has nothing but a few conveyors or cranes which handle the clinker. As to conveyors, we all know that they are dangerous. As to cranes, there are fire hazards with electrical apparatus, carrying of loads over workmen, approaches for cranemen to enter and leave crane, danger where truck wheels pass near walk or steps when it would be possible for men to reach or lean over runway.

In the finishing mill, as a rule, we find about the same machinery that we have in the grinding end of the raw mill.

Machinery is not our only hazard in the mill, as the danger of material of all kinds left on walks, platforms, hoppers and scaffolds may fall and cause many accidents.

The stock house and packing rooms have their dangerous places, such as drives for tunnel screws which usually are placed in a low basement. Here as well as many other places throughout the mill the oiler should be considered, for he is placed in a dangerous position where he must be careful.

In the packing room there are the usual screws, belts, elevators and other driving machinery, as well as packing machines, which are dangerous.

At the stock house it might be well to mention the railroad, for here we have the loading platform, which must necessarily be as close to cars as possible, causing a hazard which must not be overlooked. The railroad is a source of hazards all over the mill, particularly where cars pass doors to buildings as well as at the ends of buildings where men are apt to step out on the track in front of trains.

The slipping, tripping and falling hazard is present not only in the mill, but in the yard, shop, and even in the office unless rubbish of all kinds, as well as machinery, tools, lumber, etc., have their proper place of storage.

The wearing of torn clothing, flowing neckties, loose sleeves, as well as gloves, are all hazards.

We believe that a hazard that should also be taken into consideration is that of the health of the employes. In order that the men can go about in a contented manner, the physical surroundings must not only be safe, but must also be healthful. Plant sanitary equipment is a part of these physical surroundings and plays an important part, not only in the happiness, but also in the health and happiness of his family and the community.

Belts—The hazards connected with the operation of belts are those of getting caught between belts and pulleys, or having hand cut or burned by moving belts, grasping a moving belt to stop a machine, or shift a belt, putting belt on driving pulley while in motion. Where there is a possibility of workmen passing through moving belts, attempting to step over them, or work in close proximity to them, creates a great hazard.

Hand Tools—The hazards connected with the use of hand tools apply to both the user and to others who work within the range of flying objects from such tools, such as hammers, and chisels with mushroom heads, or hammers flying from handles.

Goggles—It is estimated that 200,000 eye injuries occur annually in the United States. Not all of these are industrial accidents, but there are approximately 15,000 persons who are blinded in industries. The money loss to the employer and employee is unknown, but the suffering and privation of the injured persons is enormous, and is of greater consequence. It has been demonstrated in recent years that most industrial eye accidents can be prevented by wearing proper protection over the eyes.

Platforms and Scaffolds—Platforms and scaffolds when properly constructed and built of defective materials, are a great source of danger. Oftimes men who are put on erection of such work are careless, and do not give this matter sufficient thought to make conditions safe.

Couplings and Collars, Keys and Set Screws—Shaft couplings, and set collars, clamp couplings, jaw clutch couplings, universal and flexible couplings, friction

clutch couplings, where exposed, key seats in end of shaft, where exposed to contact, set screws on revolving parts, where exposed to contact, are all full of hazards.

Pulleys—Pulley hazards are apt to be great in cases where a belt slips off the pulley and becomes wedged between the hanger and the pulley, or between two pulleys, thus pulling down the line shafting.

The Construction of Guards is an important safety factor, and if not properly constructed present many hazards.

Boilers—There are many hazards connected with the operation of boilers. The inspection of boilers, the operation, the water gauge glass, the safety valve, the blow-off pipe, the collection of scale and sediment in the boilers, and many other things are full of danger.

Grinding Wheel Hazards—The operation of machinery at high speed always increases the accident hazard, unless the utmost precaution is exercised, and the grinding wheel, whose cutting surface generally has a velocity greater than a mile a minute is no exception.

Chains, Cables and Slings—Chains, cables and slings are the mediums by which loads of material are suspended and transported through shops and mills, and offer many hazards which can be eliminated only by proper care.

Signs—In plants where electricity is used the hazards are greater because so many men do not know the danger that lies in the electric wire. Electrical hazards are of great importance, and can in many cases be contributed to: Failing to ground all conduit pipes, leaving conduit pipes open so water can enter, using pieces of wire as a fuse, putting a fuse where water will reach it, inclosing a motor or generator to shut off the air, failing to pull the switch before replacing fuses, carrying steel tools when working around dangerous electrical machinery, failing to insulate the handles of tools, failing to blow the dust out of the generators and motors, failing to clean wires before splicing them, failing to tape splices and all other places where insulation is required, screwing lamps in sockets while the current is on, lighting cigarettes by means of switches, looking at an electric arc without wearing blue goggles, failing to replace all safety devices, taking any unnecessary chances, using any defective machinery, or allow machines to be used which are not properly grounded, failing to report dangerous places, failing to read the rule book and obey the rules, failing to test work before leaving it, working on live circuits unless necessary, closing a switch without full knowledge concerning that circuit, and why the switch was open, failing to wear the safety belt when working on poles.

The best remedy for all electrical hazards, which should be brought out very strongly for the benefit of the workman rather than the electrician, is to let electrical apparatus and all wires alone.

Infection Hazard—The infection hazard in the cement industry, we believe is less than any other, but nevertheless great precautions must be taken.

Ladders—In ascending or descending from one level to another, ladders have been an important factor. The ladder in its various forms, has been called one of civilization's most dangerous devices, and statistics show that a great number of accidents have been caused by its use.

Welding—Some of the hazards connected with the oxy-acetylene welding may be found in the following: Testing reducing valves or gauges; coupling reducing valves; having generators near fires or lights; failure to wear goggles when engaged in welding and cutting; wearing improper goggles; failure to properly repair defective parts after notice; the use of matches; careless handling of oxygen and acetylene cylinders; using an acetylene cylinder when it is lying flat in a horizontal position; failure to shut off gases overnight; using a hammer to open an oxygen cylinder valve; failure to open cylinder valve slowly; failure to wear respirator; failure to provide a fire extinguisher, or a bucket of water for every welding unit.

These are a few of the many hazards, and the practice of safety principles does not cause a workman to be slow, timid or overcautious. It demands no sacrifice of time, or progress, and no impairment of efficiency. It insists on the adoption of the safe course in preference to the unsafe. It emphasizes the importance of seeming trifles where preservation of life and limb is concerned. It tends to develop in the workman an instinct that scents danger, weighs possibility and consequences and awakens in him an actuating consciousness of the necessity for using care at all times.

Mortar Joints in Concrete Blocks

Cracking of concrete block walls at mortar joints indicates a structural defect in either the foundation or the wall, which develops a crack in the weakest place; namely, the mortar joint.

In constructing a concrete block building, the bearing strength of the soil must be ascertained and concrete footings of sufficient width must be designed to distribute the load over a proper bearing area. The foundation must then be accurately and firmly placed upon the footings so that there will be no possibility of the foundation failing in any part.

Assuming that the foundation has been substantially constructed, the most common causes of cracks developing in concrete block walls are expansion and contraction due to temperature changes in walls built without reinforcement, piers, pilasters or cross-partition bonding. Where such a wall exceeds 30 feet in length, it is desirable to guard against cracks by occasionally filling one or more of the hollow spaces (preferably beside a window or door opening) with 1:2½:4 concrete of quaky consistency. If the wall is subjected to unusual stress of any kind, ½-inch reinforcing rods may be introduced at the time of filling the hollow spaces with concrete. If a hollow space is filled in this manner on each side of a window, a reinforced concrete pier is created which gives remarkable stability to the wall.

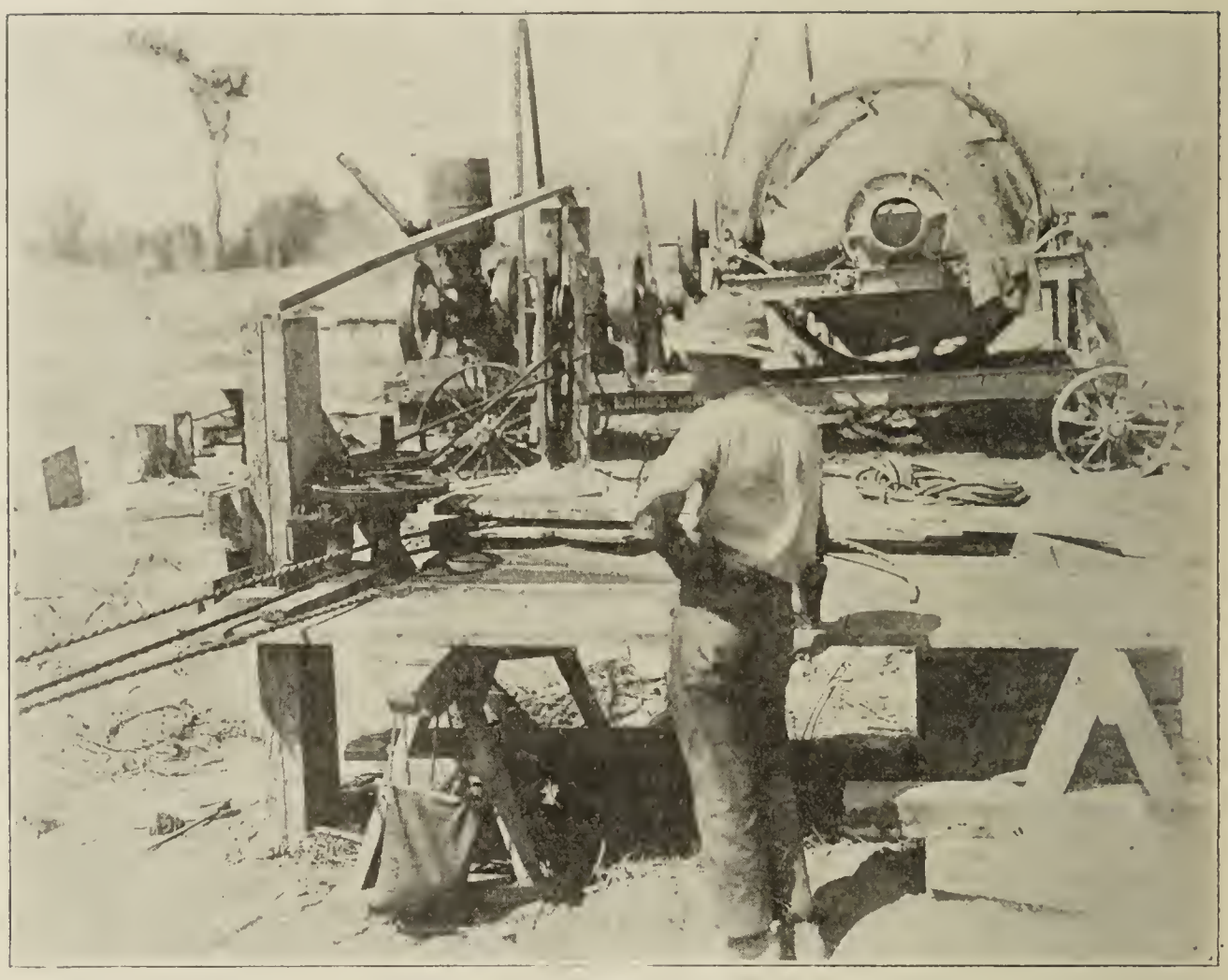
Concrete block should invariably be laid in cement mortar, mixed in the proportion of one sack of Portland cement to 2 cubic feet of clean sand. A small quantity of hydrated lime, not exceeding 10% of the weight of the cement, may be added for the purpose of making the mortar easier to work. Block should be thoroughly soaked with water before laying in the wall, in order to prevent them from absorbing water from the mortar. No mortar should be used after it has been wet more than 30 minutes. Mortar joints should be uniform and carefully filled. Nearly all manufacturers of block machines now furnish mortar plates or templates, which make it easier to secure uniform joints; ⅜-inch is probably the best thickness of mortar joint to adopt.

A Novel Steel Bender

By R. E. Herrick

A recent example of a good home-made job was encountered in the course of construction of a syphon under the Boise river near Caldwell, Idaho. This structure is 2,000 feet long and five feet inside diameter and is made from reinforceed concrete. Square twisted bars 5/8-in. thick were used for reinforcement, and it was found that if these bars were all laid out end to end they would extend a distance of 37 miles. It was apparent that if the usual practice of bending these bars by means of hand power benders were adopted the costs would run sky high, but a little thought and ingenuity solved the problem.

The mixing for this job was done by means of an Austin Cube mixer mounted on a portable truck and connected up with a gasoline engine. This mixer is charged by means of a hoist and charging hopper, and by disconnecting the mixer the engine and hoist can be operated as a separate unit. This was done, and a grooved wooden pulley about two feet in diameter made up and bolted to the hoist drum. Then an ordinary wagon tire bender was set up on end and bolted to heavy uprights, thus making the rolls vertical instead of horizontal, as they are usually used. A grooved sheave was attached instead of the long handle and a manila rope drive rigged up to the grooved pulley on the hoist drum. A sliding idler pulley was rigged between the bender and hoist to give the proper tension on the rope. A rough work table was set at the right height, and it was ready to operate.



Bending Bar on a Construction Job in Idaho.

One man inserted the ends of the reinforcing bars between the rolls and steadied them by means of a heavy pair of blacksmith tongs. Two and three bars could be handled at one time, and as fast as one bar was bent it was removed by the helper. In this way from three to six bars could be bent per minute, and made the entire job of bending the 37 miles of steel but a matter of only about two days' time, thus effecting a saving of a considerable amount of money.

Santa Monica Pier Failure Due to Permeable Concrete

A commission of engineers recently submitted its report to the City Commission of Santa Monica, Calif., on the conditions and causes of failure of the municipal pier of that city. Recommendations regarding the reconstruction of the pier also were included in the report. The following extracts from the report are reprinted from the Architect and Engineer:

Our examination revealed that while the chemical disintegration of the concrete itself took place, in general, under water, or between high and low tide, the cracking of the concrete along the lines of reinforcement took place almost entirely in the caps and struts and above high water in the piles.

This cracking, as though the result of a wedge-like action at the reinforcing rods, is so general throughout the structure above water that it points to general corrosion of the metal due to one or both of two causes—permeable concrete, as indicated above, or electrolysis.

Although the nature and the degree of the corrosion, and the even yet detectable difference of potential, might furnish slight reason for thinking that electrolysis had something to do with the initial fracture of the concrete, we are of the opinion that the most potent cause of the corrosion was the porous, permeable concrete which allowed the salt sea air to penetrate to the steel.

It is clear from the above that the cause of the present condition of the pier was permeable concrete. This permeability can result from several causes, any or all of which may arise in the absence of the most rigid and competent inspection and careful and conscientious workmanship, or from improper design.

In the light of the present day knowledge, permeable concrete may result from the use either of too much or too little water. Numerous experiments have demonstrated this.

The concrete may be so placed in the forms that there is a separation of materials and consequent alternating dense structure and rock pockets with a large percentage of voids. Forms may be so poorly designed as to be leaky and so allow the loss of the cement, leaving an unfilled mass of aggregate.

Reinforcing steel may be placed too close to the surface to permit of its being adequately covered even with the most dense concrete obtainable.

Forms may be removed so awkwardly and piles may be handled so roughly that the "skin" of lime carbonate is broken and so access is given to the interior concrete for the salt water.

Many if not all of these facts have become known as the result of the experience and experiments of the last few years and were not available to the designers of marine concrete construction a decade ago.

In the light of our present information it is realized that the reinforcement should have been more deeply imbedded, but at the time the pier was designed any engineer would have said it was quite sufficiently covered.

The diary of the inspector records that beach sand and gravel were used in the concrete. This we believe to be an unsafe practice in reinforced concrete construction, for the salt contained therein facilitates the corrosion of the metal reinforcement. Moreover, because of the sorting process of nature in the formation and deposit of beach sand, a very uniform, ungraded product results, which requires the use of an excessive amount of cement to prevent getting a very lean porous mixture. Clean sand and gravel or crushed rock should be used and so graded that, with the cement and a proper amount of water the least volume of concrete will be produced with a given quantity of ingredients. This will produce a dense impermeable concrete.

It should be needless to say that any skimping of the cement required for a properly proportioned mixture would result in a poor and permeable concrete.

In consideration of all of the above facts and observations we believe we are fully justified in concluding that the prime cause of the failure of the pier was the permeable concrete resulting from unskilled and poor workmanship and improper selection and use of materials. A possible contributing cause was the occurrence of two quite severe storms during construction, which cracked many members of the structure, rendering them still more liable to attack by the sait water and air. Electrolysis may have accelerated the corrosion of the reinforcement in the earlier days of the pier, but we do not find evidence of its present operation.

It is possible to repair the present structure by replacing, bent by bent, the concrete substructure in its entirety. Whether this is economically feasible or not may be best determined by considering the probable cost of doing such repair work as compared with wrecking the pier and building an entirely new one.

Advisability of Use of Reinforced Concrete for New Construction. Before expressing an opinion on this subject, we consider it necessary to state a few facts which have an intimate bearing on it.

Much has been written in later years on the subject of "the action of sea water on concrete," but the consensus of opinion seems to be that reinforced concrete can be made which will successfully resist the action of sea water, but to accomplish this the concrete must be made as dense as it is possible to make it, and protected from serious rupture of its surface where exposed to the direct action of the sea water or salt air

The quantity and quality of the water used in making the concrete has a most important bearing on the density as well as the strength of the concrete, and on no account should sea sand or sea water be used in its manufacture.

The selection of the materials and the mixing and placing of the concrete must be done under the supervision of a competent engineer, by conscientious and skilled workmen, and with great care.

In the making of a reinforced concrete to be exposed to the action of the sea water and sea air, the personal equation of the employe has an important bearing. A careless or incompetent workman can easily ruin a batch of concrete, and an unscrupulous one would have no hesitation about dumping it in with the other batches, and thus ruin a pile, or other member of the structure. Good materials and unremitting attention to the mixing and laying in the forms, is the price of good concrete for use in sea water.

In the case of structures involving the use of long reinforced concrete piles particular care must be taken to avoid any considerable flexure of the piles in handling, or fine hair cracks will be formed which will permit the penetration of salt water to the reinforcement. It has been well established (Hool & Johnson, 1st edition, page 271), that concrete reinforced with steel does not elongate under tensile stress to any greater extent before cracking than plain concrete. This must be taken into consideration in designing piles.

It must be borne in mind that much of our knowledge of the way to make concrete which will resist the action of sea water has been gained since this pier was built, and it is far from our intention to cast reflections on any one in connection with its construction, for we believe that it was well designed and constructed under considerable difficulties. Our only finding is that the materials of the concrete appear to have been not well selected, and not combined in the proper proportion with the proper amount of water to make a sufficiently dense concrete to prevent the sea water from reaching the imbedded steel.

In consideration of the above facts and having in mind the difficulties attending the making of a structure impervious to moisture, particularly in replacing the present piles and other concrete substructure without removing the deck, we are of the opinion that it is inadvisable for the city of Santa Monica to attempt to reconstruct the municipal pier in reinforced concrete.

New Concrete Bridges and Culverts for Wyoming

Bids for the construction of bridges and culverts upon fourteen projects are now being received by the State Highway Commission at Cheyenne, Wyo. If they are acceptable, contracts for the work will be awarded this month. The estimated cost is $325,000 and the work comprises improvements in all sections of the state, although special attention is given to the needed work on the Lincoln Highway.

Lincoln Highway improvement upon which bids are being received is as follows: Culverts on the Lincoln Highway in Carbon County, from Medicine Bow to Old Carbon, and an 80-foot reinforced concrete bridge over the Medicine Bow River consisting of two 40-foot spans. Culverts, including six reinforced concrete box type culverts, and two bridges on the Lincoln Highway in Sweetwater County between Thayer Junction and Red Desert. The first bridge is located at Thayer Junction and the second at Bitter Creek, four miles east of Point of Rocks. They will be of 28 foot and 24 foot concrete spans respectively.

Bridge over Black's Fork of the Green River in Uinta County, upon which bids have been asked for two different designs; first a 90-foot steel open span, and second two 50-foot reinforced concrete spans.

Culverts, including two reinforced concrete box type culverts, on the Linoln Highway in Uinta County between the City of Evanston and the Utah State line.

News of the Sand and Gravel Plants

The problem of utilizing the spare time of his employes has been solved by Mr. E. A. Baker, a shipper of sand and gravel at Noblesville, Ind., in a novel and at the same time practical manner. Mr. Baker has estblished a plant for the manufacture of concrete products. This is an idea which could well be adopted by other sand and gravel plants. Such a plant would enable the dealer to retain the services of his employes during dull times, keep in his employment experienced and efficient help and have at all times sufficient number of men to operate his gravel plant. The time of the men can be utilized to good advantage during weather that would not permit outside work, or during delays from any other reason. The initial investment need not be large and can be readily increased as the possibilities for the manufacturing of concrete products improve.

Obtaining his aggregates at the cost of production only, the gravel dealer has a decided advantage over the concrete products manufacturer who must purchase his aggregates from the dealer. Influenced by these considerations Mr. Baker has erected a small concrete products plant near his gravel pit and has installed up-to-date equipment for the manufacture of blocks and fence posts. The plant is equipped with steam curing chambers to insure a uniform and properly cured product. Several thousand fence posts, this winter, have been made for early spring delivery. Mr. Baker is convinced that this concrete products factory can be made a paying adjunct to his sand and gravel business.

The Coast Rock & Gravel Company, 500 Call Bldg., San Francisco, has recently been incorporated, merging the operations of some of the largest rock and gravel companies in central California. The new company will be an operating company only, and is capitalized at $250,000. It has taken over the operation of the Oroville and Fair Oaks rock crushing plants of the Natomas Company of California, the rock and gravel plants at Niles and Eliot of the California Building Material Company, and the rock plant at Logan, San Benito County, of the Granite Rock Company, whose office has been located at Watsonville. The officers of the new company are as follows: President, F. N. Woods, Jr. (Vice-President of the California Building Material Co.), Vice-President, A. R. Wilson (Manager of the Granite Rock Company), Secretary and Treasurer, C. A. Roller (of the California Building Material Co.), General Manager, E. J. Goodpastor (Manager Rock Crushing Department of the Natomas Co.), Purchasing Agent, Leigh Jones.

Mr. Emery Oliver, general manager of the Natomas Company, is one of the directors of the new corporation. The company will operate throughout central California, having sub-offices, with district representatives in charge, at Oroville, Sacramento, Stockton, Watsonville, and San Franciso.

In providing for a large winter storage of gravel under water, the Granite, Sand & Gravel Co., Indianapolis, Ind., have utilized an exhausted gravel pit, provided for the extension of gravel excavation beyond former limits, have completely utilized the established screening plant without change, have reduced the cost of excavation, have separated their plant into two independently operating units reducing overhead and waste expenses, and have increased their total capacity of production from 10 to 15 carloads per day.

The original plant consisted of a cableway about 600 feet long on which was operated a 2-yard Sauerman dragline bucket that had excavated, to a depth of 40 feet below water level, an elliptical area about 500 feet wide and 1,200 feet long and had delivered the gravel to a screening and loading plant adjacent to the railroad track at one end of the cable.

After six years' operation, the dragline excavator had reached its limits and some other methods had to be devised for excavating the gravel and delivering it to the screening plant. A floating 1¼-yard clamshell dredge was therefore installed in the pool and attacked the edges of the banks beyond the reach of the dragline bucket. The overburden, averaging 3 feet, is allowed to fall into the water when the bank is undercut, thus saving a stripping cost of about $2,500 per acre. The clamshell delivers to a 60-yard bottom-dump barge moored alongside which is propelled by a gasoline engine and transports the gravel to the center of the pool and dumps it under the cable where the dragline bucket reclaims it and delivers it, a distance of 200 or 300 feet, to the screening plant where it is handled at the rate of about 2 yards per minute. By this arrangement, the excavation and storage of gravel can go on continuously whether the screening plant is operated or not, and a large accumulation of gravel may be held in readiness for any demands.

The W. H. Cloud Molding Company of Louisville, Ky., daily capacity eight cars, excavate and load their material by belt conveyor loader manufactured by the Portable Machinery Company of Passaic, N. J.

The United Materials Co., South St. Paul, Minn., will shortly start the operation of a large new sand and gravel crushing and washing plant at that place. It will be modern throughout and will have a daily capacity of approximately 3,000 tons. The gravel deposit on the United Material Co. property is estimated to contain 110,000,000 cu. yds. of sand and gravel. Practically the entire season's output has already been contracted for. They will excavate and load their material by a steam shovel and portable wagon loader. Have not as yet purchased their crusher.

The E. T. Slider Company, Ohio river sand and gravel producers, have two yards, one in New Albany, Ind., and the other in Louisville. They have just completed extensive improvements and repairs on one of their largest sand diggers, which is equipped with a No. 36 Symons disc crusher.

The Grand Rapids Gravel Company, Grand Rapids, Mich., have filed articles of association, capital stock $100,000. The stockholders are Dewey D. Battjes, William J. Breen and Henry N. Battjes. They operate an Austin and a Gates gyratory and two No. 24 Symons disc crushers, also two steam shovels and a locomotive crane and a P. & H. excavator crane.

The Boyer Valley Sand & Gravel Co., Woodbine, Iowa, recently incorporated, capital stock $150,000, operate a Negley dragline cableway excavator and are also going to install a centrifugal pump.

On the question of operating economies, the Greenville Stone & Gravel Co., W. E. McCourt, superintendent, Williford, Ark., advised that it is installing stripping pump to take the place of stripping by hand, teams, etc. It has moved 100% more stripping by hydraulic pressure than with the old method of teams, etc., and with a decrease in cost of at least 40 or 50%.

Felsite is produced at Spring Valley, Calif., by the Fenton Parker Material Company, the annual output being 100,000 tons. Derrick and tram cars are used for getting out the material, which is then conveyed to the plant on tram cars, and run thru the crusher equipment consisting of eight Gates gyratories and 24-in. Symons disc.

The National Concrete Materials Co., Luverne, Minn., are in a position to make prompt shipments of washed and screened sand and gravel and pit run materials from their plants at Luverne, Minn., Akron, Iowa, Sioux Falls, S. D., and Madison, S. D.

News of the Crushed Stone Quarries

The Gruendler Patent Crusher & Pulverizing Company has just received a contract from Chas. D. Metcalf & Son, San Angelo, Texas, for a crushing plant. It is now in the course of construction and will be completed in April. The plant will have a capacity of thirty tons per hour and consists of crusher bins, portable elevator and crusher, all mounted on trucks.

A large tract of limestone bluff at North McGregor, Iowa, will be commercialized as the result of the organization of the Marquette Stone Products Company at a meeting of local business men. The company will capitalize at $100,000. A large block of the capital already has been subscribed and the rest will be sold locally to the two towns of McGregor and North McGregor. J. Kramer, McGregor, is president of the company and J. M. Berry, North McGregor, secretary and treasurer.

The new company is the outcome of the enterprise of a small concern that has been engaged so successfully in the crushed rock business here that it has attracted much attention. Two brothers, A. A. and F. A. Sawvell, some years ago became owners of twenty-one acres of land consisting of a solid bluff of limestone 200 feet high. The Sawvells found a ready market for all the rock they could get out, selling to the railroad company and shipping over quite an area in Iowa and Minnesota.

The new company of which the Sawvell brothers are stockholders will now greatly enlarge this plant, expecting when fully running to employ about thirty men.

The lime manufactured for agricultural use in the United States in 1918 amounted to 391,047 short tons, valued at $2,698,848, according to figures submitted by the producers to the United States Geological Survey. The raw limestone pulverized and sold for land dressing amounted to 1,091,918 short tons, valued at $1,626,292. Compared with 1917, these figures represent a decrease of 20 per cent in quantity of lime and an increase of 5 per cent in quantity of limestone used in agriculture.

The Sullivan Machinery Company, 418 Gas Bldg., quarry owners, Chicago, has recently issued a number of bulletins of particular interest to quarry owners. These are devoted to the Sullivan straight line type of air compressors with simple steam and air cylinders, the gasoline-engine driven portable compressors, the angle-compound power-driven air compressors, and the tandem compound Corliss air compressors. Other bulletins describe the Sullivan valveless stoping drills, the Sullivan water hammer drill, the Sullivan utility forge hammer, operated by compressed air or steam, and the Sullivan drill steel furnace for oil or gas fuels. All of these appliances are the result of years of experience on the part of the manufacturers and of approved practice. They have all been tested and found to be fully up to the exacting requirements of the stone industry.

The Monmouth Stone Co., Monmouth, Ill., recently organized, is progressing nicely with the construction of its new plant, and there is no reason to believe at this time but that the plant will be in operation by May 15. The company purchased another large 2½-yard Bucyrus steam shovel, which will arrive in about ten days. They have also purchased a 25-ton locomotive and twelve all-steel quarry dump cars. The workmen now have the railroad tracks into the quarry and it is expected to have one of the small stone crushers shipped from Milwaukee soon. The new building for housing the employes is completed and furnished, ready for occupancy.

The Spencer Quarry Co., Spencer, S. D., has let all contracts for machinery to the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., and is erecting a 400-ton per day crushing plant. The crusher building is 37 ft. long by 34 ft. wide and 65 ft. high. The railway car-loading bins are 44 ft. long by 16 ft. wide by 22 ft. deep. The rock to be crushed will be hauled direct from the quarry up an incline. A style K Gates crusher, size No. 6 will be used for a primary breaker and a size No. 3 style D Gates crusher will be used for making the fine grades. A revolving screen 20 ft. long and 40 in. in diameter will be used for sorting the different grades of rock into the bins. This screen contains six sections of varying sizes which will turn out the following sized grades: dust and fines, ⅛-in., ¼-in., ½-in., 1-in., and 2-in. Other machinery to be installed includes one 12-ton trolley; 8-ton Yale & Towne hoist and one friction hoist. The form of power to be used in running the crusher plant has not been decided upon. An effort is being made by the company to secure electric power from the plant at Sioux Falls. It will require approximately 100 h. p. to run the entire plant.

The big demand for mineral aggregates for the hard road-building program in Minnesota has prompted the Mesaba Iron Co., Duluth, Minn., to crush a low-grade rock iron ore. Two and one-half tons of rock are required to make one ton of iron from this material,

leaving 1½ tons of commercial crushed stone. Dwight E. Woodbrige, member Board of Directors, National Crushed Stone Association, is assistant general manager of this company.

The York Valley Lime & Stone Co., of York, Pa., is now being operated under new management, with Robert H. Lafean, as manager. It is expected to open the lime plant in the fall with a capacity of from 780 to 1200 barrels daily, running twelve kilns. The new crushing plant is in course of erection and after May 20th, will have a daily output of 800 tons of crushed stone. The company will also manufacture hydrated lime, and pulverized limestone.

"Mr. Quarry Owner," writes Mr. A. Anthony, 812 Fifth Ave., Oakland, Calif., "have you a quarry and rock crushing plant that is fully equipped with up-to-date machinery, having transportation and plenty of rock resources and man power, yet you know that production is not satisfactory? Why not consider my proposition as expert efficiency man? I will on salary basis and bonus guarantee to increase production to maximum capacity."

The new lime plant at Luckey, Ohio, which the Luckey Lime & Stone Co. is erecting are putting in a railroad siding and a 33,000 voltage high tension line for their new plant. They have the quarry staked off and have started to drill the well preparatory to starting work on the new building.

The Franklin Limestone Company operate quarries and crushing plants at Franklin, Mimms and Whitehead, Tenn., daily capacity 1750 tons. They have a 7½ and No. 5 Gates crushers and a 7½ and No. 6 Austin and a No. 6 and No. 5 Gates, also two Jeffrey pulverizers.

The Duluth Crushed Stone Co., Duluth, Minn., has purchased 160 acres of hillside property at Gary, Minn., and will let contracts in the near future for the erection of a new crushing plant, homes for employes and a workingmen's hotel. The new crusher will have a capacity of 3,000 tons every ten hours. The capacity of the old crusher is 700 tons in ten hours. The new buildings will have a concrete base and the superstructure will be of timber with steel reinforcement. The latest type of crushing machinery will be installed. Under a recent amendment to the articles of incorporation the Duluth Crushed Stone Company has increased its life until 1950 and increased its capital stock to $300,000. The company was originally incorporated for thirty years in 1903. F. A. Brewer is president and C. D. Brewer, secretary-treasurer.

The Wisconsin Granite Company, 11 S. La Salle St., Chicago, is installing a very large new rock crusher in Sioux Falls, S. D., the foundations already being in process of construction. J. J. Sloan, of Chicago, secretary of the company, was in Sioux Falls several days attending to the plans for the enlargement of the plant there, which is expected to treble the capacity of the company. The new rock crusher will be a 36-inch Allis-Chalmers jaw crusher. Steam shovels will be installed for loading. The bins will also be arranged so that the rock can be loaded onto trucks, wagons and cars at the same time. Unless the materials are delayed in shipment, the plant is expected to be ready for operation June 1.

Breaking Up Concrete

By Chas. E. Riker, New York

A bank in this locality had a large vault. It was made of brick set in the best Portland cement and guaranteed to be fire and burglar proof. The walls were 20 inches thick and the vault was 14 ft. long, 12 ft. wide and 7½ ft. high. The roof was 2½ ft. thick supported by six 12-inch eye beams, each weighing 325 pounds. The whole constituted a ton of steel and 49 tons of brick and cement.

When the bank took up new quarters across the street, it was necessary to dispose of the vault and I was employed to remove it. There were five plate glass windows 40 ft. away, besides seven transoms, four small windows and four glass doors which were in close range. The brick side walls were 4 ft. away and the ceiling 14 inches from the top of the vault.

I protected the plate glass by a canvas screen hung from the ceiling. The windows, I boarded over. Five feet away from the vault on one side with only a thin brick wall intervening were girls selling dry goods and on the other side several girls trimming hats.

I first drilled a 13-inch hole into the wall of the vault near the door and loaded it with ⅓ cartridge of 40% dynamite tamping the charge with damp sand. Before firing the charge I placed some heavy planks and timber, also a heavy canvas, over the bore hole. The shot, which, of course, was a light one merely loosened a number of bricks but it gave me an idea how heavily I could load.

I then loaded three holes 18 inches apart and 18 inches from the end of the wall which were fired simultaneously by means of a blasting machine. These holes were also loaded with light charges as, of course, it was necessary to break up the concrete in small bits rather than to attempt to smash it up with one charge as would have been easily possible had it been out in the open and there had been no necessity for protecting nearby buildings and glass.

In the course of fourteen days, the job was finished. The salvage was mine and reckoned as part of my compensation. I sold the eye beams for $31.00; some miscellaneous junk for $1.75 and the brick and other salvage material for sufficient to make my total receipts $235.75. I paid $28.83 for team hire, $44.25 for labor, $2.60 for dynamite, $5.00 for electric blasting caps and $5.00 for incidental expenses. My own time I figured at $5.00 per day.

The foregoing is merely intended to show that concrete structures in congested residential and business districts can be removed with dynamite at comparatively small cost and without damage to adjoining buildings.

All About Perforated Metals

The producers of sand, gravel and crushed stone who desire to have at hand a tabulation of information regarding perforated metals can do no better than secure the new catalogue of the Hendrick Manufacturing Company, Carbondale, Pa.

This is a book of 128 pages showing in full size the various types and arrangements of perforations for screen plates, also several pages of tables of perforations showing the size, space between holes and other data according to United States standards.

The catalogue also lists and illustrates a large number of different types of manufactured screens which the company is prepared to supply on short notice, as well as elevator buckets and conveyors. The company is also prepared to supply special screens if desired.

Thousands to Get Free Trips to Sullivan Plants

By S. B. KING*

Hundreds of mining and engineering school students in all parts of the United States are being taken on trips to the Sullivan Machinery Company's plants in Claremont, New Hampshire, and in Chicago so that they may see just how drills, coal cutters, quarrying machinery, air compressors and drill sharpener machines are made. This summer thousands of miners and engineers, who have been using Sullivan machines, will make the same excursion, to view the "home life" of their mechanical friends. The students, engineers and workmen will be Sullivan guests, the company to bear all expenses. And it will not cost Sullivan Company so very much because the guests will make the trip via the Film Rapid Transit.

The Sullivan Company believed workers and engineers would have an even greater appreciation of Sullivan machines if they could be shown where and just how the machines are made. It being impossible to get the thousands of men to the plant, it was decided to place the plants, corner stones 'n everything, aboard the celluloid magic carpet and take the industries around to the men. The Rothacker Film Manufacturing Company of Chicago was selected to make the film.

"Building Mining and Quarrying Machinery at a Yankee Shop" is a three-real picture. It was completed in time to do considerable work this spring in schools. This summer it will be loaned to engineering societies. Employers who have equipment for showing films may borrow it.

The Sullivan picture has a traveling companion, "The Story of Coal," which is borrowed from the United States Bureau of Mines. This coal film, which also was made by Rothacker cameramen, is considered the finest coal mining picture ever made. It tells the complete romance of coal, from the sinking of the shaft to the final loading into the cars. The film includes a trip through a coal mine many hundred feet underground.

The Sullivan picture opens with panoramic views of the Claremont and Chicago works. The movie audience then visits the interior of the Claremont foundry and sees the pouring of air compressor castings. The air compressors, made of both the Claremont and Chicago plants, are then followed through the various stages of machining, assembly, erection and the final testing at full speed and load before shipment. Interesting details include the gigantic planer at Chicago on which twelve angle air compound compressor frames are planed at one operation; the assembling of water valves and of finger valves used in the different compressors; and the steam valve action on one of the Company's 2,500 Corliss Compound Air Compressor in which the operation of the Corliss valve gear is clearly shown.

The second part of the picture is entitled "How Hammer Drills are Made." The fact is emphasized that the Company's Rotators, Water Drifters, Stopers, etc., are made not from castings but from solid billets of steel or from steel bars. The observer is shown the wonderful automatic machinery by which the different parts are milled, shaped, and ground to the exact sizes and close fits needed in this class of machinery. Materials are shown under test in the Company's chemical and physical laboratories and also in the carbonizing and heat treating department, in which rows of furnaces, flanked by quenching baths of different liquids and at different temperatures, give the parts of the drills the necessary hardness and toughness to resist the terrific strain of pounding upon rock. This section of the film is completed by a trip to the Company's quarries or proving grounds, where the completed machines are tested for air consumption and drilling speed under actual service conditions. Complete views are shown of the Company's drill sharpening machine, drill heating furnaces for the better care and treatment of the drill steel used in mining.

"Incidents in the Life of an Ironclad Coal Cutter" is the third part of the film. The picture shows the various stages in the construction and assembly of the Company's Coal Cutting machine which has been the pioneer in the present economical, rapid, mechanical mining of coal. Detailed views of the completed machine were taken in the open air but under conditions simulating those in a coal mine. The government "Story of Coal" contains scenes of an Ironclad working 600 feet underground. The Sullivan picture shows the Company's new Tip Turn Truck which loads and unloads the 5,000 pound Ironclad without physical labor for the runner. A long wall, such as is used in the mines of Great Britain, and a portable electric driven air compressor are also visualized in this section of the Picture.

Testing Sullivan Rotators for Rock Drilling.

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* Advertising Manager, Sullivan Machinery Co.

Premixing No Benefit in Concrete

To determine the benefit of mixing cement and water for a long period (15 to 30 minutes), and then adding aggregates to produce a concrete instead of the ordinary method of mixing cement, aggregate and water toether for one or two minutes, comparative tests were made last year by the United States Bureau of Standards. The strengths obtained were about the same with the same materials and conditions, indicating that there is no advantage in long premixing of cement and water.

News of the Cement Mills

J. C. Buckbee, of Chicago, and J. B. John, who were appointed directors and vice-presidents for the Petoskey Portland Cement Company, Petoskey, Mich., some months ago, were both elected director and vice-president for terms of five years, at the annual stockholders' meeting. Mr. John is also general manager of the company.

At this meeting of the stockholders reports showed that good progress is being made in construction work of the new cement plant. Another forty-ton locomotive has been added to the equipment and sixteen side-dump cars are being added. Some of these cars have arrived and the rest will be on hand within a few days. Two locomotives are being used in the quarries, one at the cement plant and one for general work in the yards.

Machinery for the McDonald Engineering Co., Chicago, to be used in building the cement silos and stock house has arrived. Machinery of the Weber Chimney Company of Chicago to be used in construction of the two hundred foot stack for the cement plant is on the road.

H. C. Shields, who was recently appointed general superintendent of the Wolverine Portland Cement Co., Coldwater, Mich., succeeding J. C. Smallshaw, deceased, advises the folowing appointments of operating staff: W. F. Murray, mechanical engineer; L. A. Hutchins, chemical engineer; J. J. Parker, superintendent, Coldwater plant; J. S. Lockwood, assistant superintendent, Coldwater plant; L. C. Nodel, chemist, Coldwater plant; R. B. Koons, superintendent, Quincy plant; John Dieterman, assistant superintendent, Quincy plant; M. H. McGaffigan, chemist, Quincy plant, and P. H. Sweeney, assistant purchasing agent.

The Atlas Portland Cement Company of Pennsylvania has acquired the property of the Standard Portland Cement Company, located at Leeds, Alabama.

Mr. J. Ross Hanahan, former president of the Standard Company, will remain as a director of the Standard Company.

The South Dakota state cement commission of which Governor Peter Norbeck is chairman failed at a recent meeting to approve of Yankton as a site for the state cement plant.

This is the fifth time the committee has met at different places to discuss the location of the project for which the state legislature appropriated $1,000,000 for the building of the plant and $25,000 for investigating various proposed sites in the state.

The state cement commission was appointed last August by the legislature. Following the commission's approval of a site for the plant, the original ruling states, the legislature in conjunction with the governor of the state will have to sanction the suggestion before definite work may begin.

As in the case of Chamberlain, Lake Andes, Mitchell, and Corson of Minnehaha county, experts employed by the commission reported that it would be a matter of experimenting to establish a plant at Yankton where only chalk rock is available.

"The commission does not feel like experimenting to the extent of $1,000,000," said C. M. Harrison, a member of the board. "In a project of this nature which involves so much money, we feel it advisable to make a very careful survey before making a definite decision."

While there is material containing the proper ingredients for the manufacture of cement in various places in the Black Hills, according to the finding of experts, the commission, it was said, hesitate in approving of a location for the plant in that section of the state principally because of the heavy freight rates which would be encountered in transporting the product to other parts of the state.

"We are looking for a place where only A1 cement material can be obtained," said Mr. Harrison, "and until that time it is very probable no definite suggestions will be laid before the legislature."

Another meeting of the commission may be held next month.

The members of the state cement commission are: Governor Peter Norbeck, chairman; Frank H. Barnard of Aberdeen, secretary-treasurer; Paul E. Bellamy of Philip, W. J. Sherwood of Lead and C. M. Harrison of Sioux Falls.

The Louisville Cement Company, Louisville, Ky., is building large lime kilns on its property east of Silver Creek, Ind., and will produce a superior article of that builders' requirement there. It will add quite a number of men to the force already employed by the Company.

Mr. Dan Rollan, manager Oklee Lumber Co., Oklee, Minn., writes:

"So far since about February 1st, this year we have had notice from one of the leading cement companies of two advances, the first of 30c per barrel and the other of 20c making a total of 50c per barrel in the last two months.

"Then we have been unable to get any definite price lately, the company we buy from telling us that they did not have any cement to ship until navigation opened up on the lakes, and the price would be governed by whatever the quotations were on the day car was loaded; that there is a big shortage of cement and no price only from day to day. We have tried both to get cement and a definite price on same so we could have a price to base our estimates on, but have failed so far at least to receive either.

"We hoped the cement people would have been able to keep the same very reasonable price this year as they have the last few years so at least one part of building materials could be sold at a reasonable price, but it does not look that way, now."

Potash materials produced as a by-product in the manufacture of cement in 1918 amounted to 12,652 short tons containing 1,549 tons of potash (K_2O). This quantity represented 3 per cent of the total output of potash in the United States and was a slight decrease from that reported in 1917. The sales amounted to 11,172 tons of potash materials containing 1,366 tons of potash (K_2O), valued at $539,567 The product marketed consisted of about equal parts of dust containing 2 to 10 per cent of potash and of

potassium sulphate containing 25 to 62 per cent of potash. Twelve cement mills reported production in 1918. Seven of these mills had installed potash-recovery plants, including leaching and evaporating systems, and marketed potassium sulphate. Four mills had installed dust-collecting systems and marketed cement dust for incorporation into fertilizers. One mill had installed no potash plant but marketed a small quantity of dust that had collected in the flues and under the stacks.

The eleven cement mills with potash-recovery plants which reported production of potash in 1918 produced 6,165,000 barrels of cement, from which 6,560 tons of potash (K_2O) were recoverable. Seven of these mills were in operation throughout the year except when shut down from lack of fuel, or because of alterations or repairs, and four were in operation only a short time.

Developments in 1918 included putting into operation four new potash-recovery plants in cement mills, practical completion of construction of plants in five mills, beginning of construction in two other mills, and installation of waste-heat boilers in connection with potash-recovery plants in some mills.

About 110 cement mills in the United States produce annually about 90,000,000 barrels of cement, 70 per cent of which comes from Eastern States contiguous to large centers of consumption of potash. Estimates place the potash recoverable as a by-product in the cement industry at about 75,000 tons of K_2O annually.

Cement manufacturers which reported production of potash in 1918 are as follows:

Alpha Portland Cement Co., Comenton, N. Y.
Atlas Portland Cement Co., New York, N. Y.
California Portland Cement Co., Colton, Calif.
Coplay Cement Manufacturing Co., Coplay, Pa.
Dexter Portland Cement Co., Nazareth, Pa.
Newaygo Portland Cement Co., Newaygo, Mich.
Ogden Portland Cement Co., Ogden, Utah.
Portland Cement Co. of Utah, Salt Lake City, Utah.
Riverside Portland Cement Co., Riverside, Calif.
Santa Cruz Portland Cement Co., Davenport, Calif.
Security Cement & Lime Co., Hagerstown, Md.
Southwestern Portland Cement Co., Victorville, Calif.

At the end of 1918 potash-recovery plants were under construction by the following cement mills, the first three being practically completed:

Clinchfield Portland Cement Corp., Kingsport, Tenn.
Ironton Portland Cement Co., Ironton, Ohio.
Louisville Cement Co., Sellersburg, Ind.
Aetna Portland Cement Co., Fenton, Mich.
Peninsular Portland Cement Co., Cement City, Mich.

Cement manufacturers refuse to quote price and delivery on thousand barrel lots and up.

Frank B. Jones of the Acme Coal & Builders' Supply Co., Toledo, Ohio, says this will seriously affect all municipal work where cement is used in large quantities, such as the paving of streets. This affects the sale of sand and crushed stone. There will be no sale for these materials to go in the concrete sub-base of street paving with cement shut off.

No contractor can bid on street work that requires large quantities of cement unless he is protected as to price and delivery.

The Acme Co. has a contract to furnish the Standard Oil Co. building on the Bay Shore with 100,000 barrels. The company expects no trouble in making shipments, and carries 1,500 to 2,000 barrels for local building.

There is a shortage in all building material also. There has been no raise in the price of cement.

The Lehigh cement plant at Mason City, Ia., is closed and the Northwestern States Portland Cement plant is badly crippled because of a strike of workers, practically all foreigners, following a refusal of their demands for a flat increase of 10 cents an hour. Owners of the plants declare that their lowest paid laborers receive $4.80 a day, while some received as high as $300 a month. They insist it is impossible to meet the demands of the strikers.

The Riverside Portland Cement Company have just purchased a No. 41 traction steam shovel which they have installed in their quarry at Riverside, Calif.

The Lansing Electric Engineering Co., Lansing, Mich., has closed a contract with the Trinity Portland Cement Co., of Dallas, Tex., for rewinding and rebuilding its electric power equipment at the Eagle Ford works, consisting of 60 motors ranging in size from 10 to 225 hp. All motors will be redesigned from 25-cycle, 550-volt, to 60-cycle, 550-volt. Coils for these motors will be wound in Lansing and local men from the Lansing Electric Engineering Co. will be sent to Texas to make the installation.

The reorganization has been announced of the Alsens Cement Company, Alsens, N. Y., with a capitalization of $2,500,000.

Societe Generale Meuliere, La-Fertesous-Jouarre (S & M). France would like to hear from cement manufacturers who are in the market for silex slabs for lining tube-mills for grinding cement, clinker, etc. Their tube mill lining is moderate in price and with a reputation for doing more than is claimed for them.

The Federal Portland Cement company, the firm that is putting up the cement mill at Rutland, Iowa, has rented office rooms in the Duncan building in Humboldt, Iowa, and will open headquarters there. E. J. Dalton, vice-president and general manager; H. S. Loeffler, general superintendent; Alvin Haas, purchasing agent, and W. J. Hardy, employment manager, will have headquarters there.

The Kosmos Portland Cement Co., Kosmosdale, Ky., in spite of adverse conditions which existed early in the spring, is planning for a big season. For a period of over two weeks the company was forced to reduce to one-half capacity because of fuel shortage. At the same time the influenza epidemic reduced its labor forces to about two-thirds normal. Orders have been booked for the output of the next several months and so all possible speed is being made to better conditions. In order to be able to ship more material into Louisville the company keeps one large steel-tired, six-ton truck busy hauling cement to the interurban line two miles distant from the plant. The company is also hoping to be able to develop river traffic to such points as are available. Some little business has been done on the river where contractors or purchasers came after material with their own barges. As yet no dock equipment has been installed and so the loading of cement is slow and expensive. In view of the considerable business on hand, the company is enlarging its power plant by adding another turbine unit so that the plant may be driven either as a whole or at half capacity with better efficiency. The old engines now being used to drive the small Fuller mills on the raw side will be removed and individual motor drive will replace them. A new 100,000-barrel cement stor-

age has been completed and packing machinery is being installed. The new packing house is across the railroad from the rest of the plant and cement is delivered to it by a long conveyor belt.

An increase of approximately 12 per cent in the price of cement may interfere with proposed street improvements in Joplin, Mo., this summer, according to O. P. Mahoney, commissioner of streets and public improvements. The price now is $2.90 and $3 a barrel, 30 cents more than it cost prior to the raise which became ecective last Saturday.

The cement companies announced the reason for the price hike as the recent increase in the cost of fuel. They not only increased the price but have begun a practice of cutting orders to the absolute minimum needed for the work for which the cement is ordered. Because of this decision, Henry Kost, who has contracts for the construction of three pieces of street work in Joplin, was allotted only 800 barrels of a 2,000 barrel order.

The output of the plant of the new Indiana Portland Cement Company, W. S. Creveling, superintendent, Greencastle, Ind., is to be doubled, plans for this increased production being already under way.

Elimination of the jobber's and middleman's profits, amounting to 30 cents a barrel on all cement to be used in highway projects in Montana, is effected following an agreement between the Three Forks Portland Cement Co. and the state highway commission, according to Chief Engineer John N. Edy.

Cement prices increased 15 cents a barrel recently. In the agreement with the commission this was overlooked. The company also granted a 10-cent discount because of the immense quantity purchases of the commission and a 5-cent discount for cash in ten days.

The Peerless Portland Cement Company, Union City, Mich., has added considerable expensive equipment to its plant this year. A car-loader, invented by one of its employes, has been installed which delivers the heavy sacks of cement into the cars and stacks them up. This machine does the work of four men and is a time saver. The latest addition to the big works was put into commission last week. It is a locomotive crane, used in unloading cars of coal.

The company has purchased land in the rear of its plant and established a coal storage yard where a hundred or more cars of coal will be ready for use at any time. The locomotive crane will have general supervision over the storage yard. The big machine not only does away with an army of coal-shovelers, but will save the firm many thousands of dollars in demurrage charges on coal cars.

When the company first started operations about March 1st, it was necessary to use dynamite at Spring Arbor lake to clear the thick ice for the dredges to work scooping marl from its depths.

Plans for the erection of a $2,000,000 cement plant near Buffalo, Scott County, Iowa, by the Western States Portland Cement Co., with headquarters at Independence, Kansas, were announced recently.

The company has secured options on a number of tracts of land near Buffalo, a short distance from Davenport, and have started drilling. Upon the result of these drill tests, will rest the ultimate decision of the company regarding going ahead with the plant. Heavy limestone deposits are found all around Buffalo.

The Dewey Portland Cement Co., of Kansas City, has also purchased holdings near here, but thus far has announced no plans.

If the Western States company goes ahead with its plans for a big plant, scores of cottages, to house the workmen, will be erected on a part of the 500 acre tract, on which options have been secured.

J. F. Magee, former superintendent at Plant No. 4, Alpha Portland Cement Company, Martins Creek, Pa., has been attached to the general operating staff in the main office, Easton, Pa., with the title of production engineer.

H. R. King, formerly a member of the engineering organization, in charge of construction, succeeded Mr. Magee as plant superintendent, following the usual practice of the company to fill responsible positions with members of their own organization.

The Colorado Portland Cement Co., Portland, Colo., has installed a water softening system to provide zero water. The company is also building concrete bins for the segregation, storage and loading of scrap metal, while a new belt shop has recently been completed.

The company recently presented each employe one year in service with an insurance policy for $1,000.

The purchase of the defunct cement plant near Demopolis, Ala., on the Tombigbee river means not only that the capacity of the plant is to be largely increased, but the probability of the establishment of a terminal at that point and also a chain of barges to carry its finished product to Mobile and other points, according to J. B. Battle, assistant United States engineer in charge of the rivers, Mobile, Ala.

Martin Nester, junior United States engineer, connected with river work, has recently returned from Demopolis, and while there, was informed of the prospects of a privately-owned terminal at the cement plant. The United States engineer's officers received a request from the company for copies of the permits necessary to install loading and pumping stations at its plant, and they have been forwarded by Mr. Battle.

Mr. Battle says that the name of the new Company is the Gulf States Portland Cement Company and Mr. George P. Dieckmann, formerly chemist of the Northwestern States Portland Cement Company, Mason City, Iowa, is president and general manager of the new company. It will have a capacity of 5,000 barrels a day and a large amount of coal will be used, not only for steam purposes, but in making the cement.

William Moeller, assistant superintendent of the Marquette Cement Company, La Salle, Ill., who has been connected with the plant for more than 23 years, has resigned his position there and will leave within the next day or two for Humboldt, Iowa, where he will assume the duties of a similar place with the newly organized Federal Portland Cement Company.

Mr. Moeller's connection with the Marquette has been of a most satisfactory character, as he has had the implicit confidence of his employers and also the men who worked under him. During the troublesome times of the strike a few years ago, Mr. Moeller was one of the men largely instrumental in keeping down unnecessary friction, and it was due to the very high regard the employees had for him that many a difficulty of a serious nature was sidestepped.

Possessed of rare judgment and the ability to fathom instantly human nature, Mr. Moeller is looked

upon as an expert in handling men, and to this is added his fine knowledge of the cement business. E. J. Dalton, formerly Secretary and Treasurer of the Marquette Company, is also with the Federal Portland company.

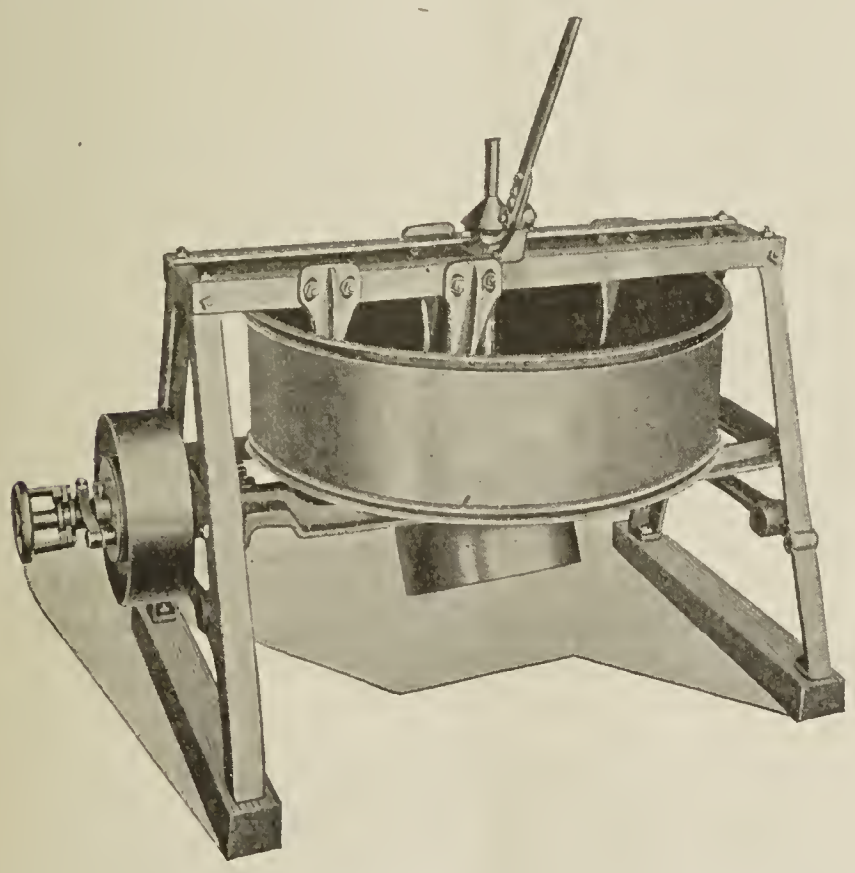
The Sandusky Cement Company, Syracuse, Ind., formerly obtained their raw material from a nearby lake but they are no longer able to secure more from this source and are compelled to look elsewhere for raw material. The new test hole which they have been drilling on the company's grounds here is now down about 280 feet. At this point they strike the shale and limestone from which they will take out cores with a core drill machine, to ascertain the quality of the different minerals they strike. If these prove satisfactory the company will sink a shaft and mine their own limestone instead of shipping it in. The company drilled one test hole last fall, but did not obtain satisfactory results. The company encountered a severe setback last week when it was discovered that the 100 carloads of limestone which the company had shipped here from a quarry at Logansport, Ind., contained too much magnesia and could not be used in making cement. The stone dare not contain more than five per cent magnesia and this contained sixteen per cent. The officials at once went to Logansport to look for new quarries which will stand the test. About seventy-five men are now idle while the search is being made for better limestone. Probably a week will elapse before any results will be known. C. J. Reilly is general superintendent, main office, Cleveland, Ohio.

The Sandusky Portland Cement company has secured another limestone deposit at Wabash, Indiana, and has shipped quite a quantity of it to their factory at Syracuse, Ind., preparatory to making cement. Chemists have analyzed this stone and pronounce it free enough from magnesia to make good cement. They expect to be making cement in another week.

The Mixer for the Concrete Products Plant

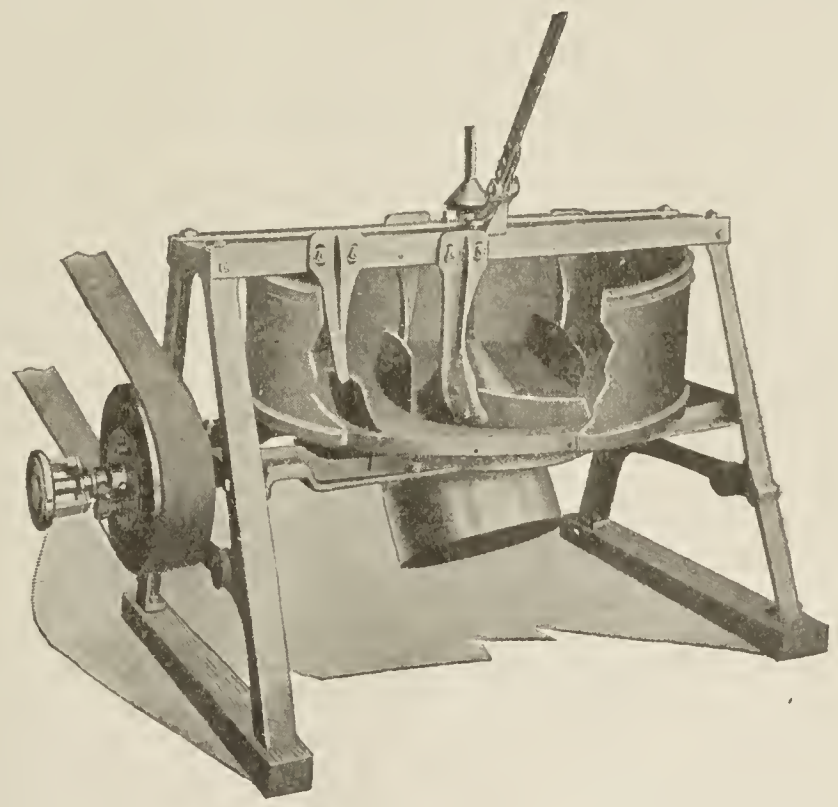
Built to Meet the Demand in Present Day Operation— Its Performance in Various Parts of the Country Has Shown Its Great Speed, Strength and Economy

Concrete products manufacturers who are always on the alert for new methods and equipment that will add quality to their products, increase production and lower their operating costs will be interested in the new concrete mixer recently placed on the market by the W. E. Dunn Mfg. Co., 414 Twenty-fourth street, Holland, Michigan, makers of concrete products machinery and equipment. This mixer has been designed, primarily, for use by plant operators, every requirement made of a mixer for plant use having been given consideration.



Its mixture is produced by shoveling the material over and over, eighty times a minute, by means of a revolving bowl which forces the material against four stationary shovels. The shovels work alternately on the mixture, two of them carrying the mix to the side while the other two return it to the center. This shoveling process insures every particle of sand or gravel being coated with cement, resulting in a thorough mix within a half minute's time.

Discharging is effected by raising a metal cone which occupies an opening in the bottom of the bowl, aided by two of the shovels and the sloping floor of the bowl, the mixture is rapidly discharged through the opening without the necessity of stopping the machine or tilting a drum. A better idea of its method of operation can be gained from the accompanying illustration which shows the design of the mixer as well as the cone and the arrangement of the shovels.



Its particular adaptability for plant use lies in the fact that it can be elevated above the molding machines, the mixed concrete being fed directly to the molds by means of spouts leading from the bottom discharge opening. This eliminates the expense of charging the molding machines by hand labor. A hoist and loader attachment, receiving its power from the drive

shaft of the mixer, can be installed which automatically charges the mixer with a full batch by simply pulling a clutch lever. This attachment allows for the continuous operation of the mixer for while one batch is being mixed another is being loaded into the bucket.

The construction of this mixer is extremely simple, the heavy bowl revolving on ball bearings which run in chilled races on the under side of the bowl. A friction clutch pulley transmits power to a short drive shaft with a pinion gear on the end which meshes with the gear ring cast on the bottom of the bowl. The shovels are adjustable so that all wear can be taken up as it occurs.

A portable mixer of this type will shortly be placed on the market by this company for contractors' use. It can mix mortar and plaster as thoroughly and quickly as it does concrete, which should appeal strongly to the average contractor.

Necessity for Careful Chimney Construction

The charred remains of one year's fires in the United States would line both sides of a highway 1,000 miles long, and yet 80% of this is preventable, says a recent issue of the Bulletin of the State Fire Marshal of Minnesota.

A summary of the fire causes in various states shows that fires attributable to chimneys amount annually to from 10 to 26% of the total number and in winter the percentage has reached as high as 50. Especially in rural districts where there are no organized fire-fighting agencies, builders should give unusual attention to the construction of chimneys that they may be made as nearly fire-proof as possible.

Chimneys should not be built on brackets, they should extend a sufficient distance above the roof, their walls should be at least eight inches thick, flues should not be less than 64 square inches, the flueholes should never be filled with inflammable material and good glue linings of fire clay or terra cotta should be provided. The cost of such lining in an ordinary two story residence would be nominal.

With the present tremendous demand for new buildings and the consequent speeding up of work, especial care should be taken to prevent carlessness in chimney construction.

Along the same lines the National Fire Protective Association is pushing a vigorous campaign, emphasizing the present need of dwellings and the extreme necessity of protecting from the fire the homes we already have. It advocates care about matches, smoking, lighting and heating apparatus and gasolene, and urges a clearing out of rubbish, inspection of flues and cleaning of chimneys that sparks may not fall on combustible roofs.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Cement & Engineering News published monthly at Chicago, Illinois for April 1, 1920, State of Illinois, County of Cook. ss.

Before me, a Notary in and for the State and county aforesaid, personally appeared John F. Waldron, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Cement & Engineering News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, William Seafert, 22 Quincy St., Chicago, Ill.; Editor William Seafert, 22 Quincy St., Chicago, Ill.; Managing Editor, John F. Waldron, 22 Quincy St., Chicago, Ill.; Business Manager, John F. Waldron, 22 Quincy St., Chicago, Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) William Seafert, sole owner, 22 Quincy St., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN F. WALDRON.

Breaking Up Cement Piers Inside of Buildings

By Frank A. Huntington, New York

In the cellar of a factory building at Batavia, N. Y., there was a cement pier 12 ft. high and 6 ft. square that the owner desired taken out. There was machinery nearby on one side and windows directly above on the other.

In building the pier the cement had been poured into forms in courses or tiers in the usual way, the junction between the courses being plainly marked. These courses were from 2½ to 3 ft. thick.

Selecting these junctions as the weakest point of attack, I drilled holes into the column 18 to 20 in. deep and 1½ in. in diameter. From three to five holes, usually one on all four sides of the column, were drilled.

For the upper courses I loaded ¼ pound of 20 per cent dynamite in each hole, well tamped in with moist clay. For the sake of safety, only one or two holes were fired at a time. Had it not been for the danger of breaking machinery, windows, or the floor above the pier, better results could have been obtained by firing all of the holes together.

Where more than one hole was set off at the same time, it was necessary to use electric blasting caps connected up with a blasting machine circuit, because in no other way is it possible to make charges go off at exactly the same instant, and unless they do go off that way the result is not satisfactory.

After loading the holes, blasting mats were made of burlap bags bound together to a thickness of about 4 in. and thoroughly saturated with water. These mats were hung over the bore holes to prevent any flying chunks of cement damaging surrounding objects.

In all, about 10 pounds of dynamite were required to break up the pier. The dynamite cost $2.50 and the blasting caps about $1.25. Labor cost amounted to considerably less than a day's time.

Concrete Poles for Wires

The Water Department of St. Louis, finding it necessary last year to replace some of the poles carrying the trolley wires of the water works railway, investigated the use of concrete poles, since poles of cedar or other wood were difficult to obtain and high in cost. It was found that the concrete would cost but little more than cedar, and forms were made and 37 poles cast and are now in service.

News of the Concrete Products Factories

J. Frank Norris, manufacturer of concrete building stone, Rochester, N. Y., writes:

"We began the cement block business in 1908 with the idea of manufacturing a block superior in quality to any other made in this city and have always adhered to this point, regardless of whether the other fellow was able to go under us in price by furnishing a block of poorer quality. This method of doing business, we are pleased to state, has practically stopped in this city and today all the local block manufacturers are turning out a first-class product."

Frank Ohlson of the Cement Block & Construction Co., Eagle River, Vilas County, Wis., writes: "Started four years ago with one machine and had to work against great odds as we are in a lumber county and someone had been here before that made a very poor block, put foundation under church and it all caved in so people were afraid to try blocks. Managed to build one house, one barn and one silo. Next year made 10,000 blocks, third year 25,000, last year 50,000. Now have three machines for blocks, one for tile, one for brick, one for posts and molds for garden furniture and trim. Have used five cars of cement this season and have only 20,000 blocks left in stock."

The Ottawa Silica Company, Ottawa, Ill., advise us they will gladly send samples of their white sand to any of our readers. Their selected white sand is unexcelled for facing concrete blocks, ornamental concrete stone, etc.

The Memphis Concrete Products company, manufacturers of drain tiles, pottery, etc., is to establish a plant on Bodley avenue, Memphis, Tenn., according to announcement made by Mark Fenton, industrial commissioner of the Memphis Chamber of Commerce. The new firm has leased a building 50x80 feet in size, which had been erected for a warehouse, and will begin operations at once.

The plant will have a capacity of 50 tons of concrete products a day. Among the products to be made are culverts, lattice work, flower pots and drain tile. R. C. Boswell, a former building contractor, will be manager of the new plant, and is heavily interested in the company.

The Spencer Cement Block Works, Peter Nelson, manager, Spencer, Iowa, are installing a machine for manufacturing concrete building tile.

Burke, Owen & Davidson, Gibsonville, N. C., want names and addresses of manufacturers of cement block machines.

Gilbreath Bros. Guntersville, Ala., want to correspond with manufacturers of concrete block machines.

A. J. Smith & Sons, Buda, Ill., are going to move to Kewanee, Ill., where they expect to build a modern factory for the manufacture of concrete products and will be in the market for a number of new machines as well as factory equipment. They would like to hear from manufacturers of polishing machines for factory polishing of granite and marble slabs and block for trim stone and interior finish. Also ornamental molds, drain tile, burial vaults, culverts, vases, porches, fence post, building blocks and brick machines. Are also interested in waterproofing compounds. At present they operate a U. S. Champion roofing tile machine, Hobbs block machine, Staple Post molds, Dunn sewer pipe molds, Merill Moore brick machine, Blystone mixer and Miracle silo block molds.

The Southern Concrete Products Company, W. C. Austin, Secretary and Treasurer, Anderson, S. C., recently incorporated, capital stock $10,000, are in the market for molds and machines for making concrete brick, sewer pipe, drain tile, vases, burial vaults and fence posts. They now have W. E. Dunn Company's sewer pipe mold and a Galion mixer.

Minnesota Cement Construction Company of Fergus Falls, Minn., advise us they expect to enlarge their factory and also build another factory in Minneapolis for the manufacture of rib stone silo staves. They use S. T. Playford improved "Rib Stone" silo molds and a Stewart mixer.

A. L. Benshoff, operates a concrete block factory at Elliott, Iowa. He uses a N. W. Double Speed block machine, Little Grant brick machine, Bolte mixer and Dunn peir molds. Is interested in tile machines, fence post molds, vases and porch molds, waterproofing compound and concrete mixer.

The Kramer Automatic Tamper Company, Peoria, Illinois, have produced something which is a radical departure in block machines. It is so constructed that it carries with it both horizontal and perpendicular cores, so that the face-down blocks may be stripped out of the mold as well as side-face blocks.

In addition to this feature, the facing of the block may be poured in a slush form, producing an absolutely watertight face on the block.

The Red Wing Structural Tile Co., Red Wing, Minn., has been organized by W. L. Murtinger, well-known local contractor and builder; Frank Mehrkins and C. W. Fenstermacher. The new company will manufacture cement products, specializing in cement building tile. A Hamilton building tile machine has been purchased and will be operated by electricity. It will be installed as quickly as possible, and it is hoped to have the plant in operation by May 30. The cement tile for building construction will be 5x8x12 in. in size. The plant at the start will have a capacity of 6,000 pieces of tile daily. They advise CEMENT & ENGINEERING NEWS they expect to add concrete brick, fence post, drain tile, silos and vase molds.

The B-J Concrete Products Co., Red Oak, Iowa, has been incorporated for $50,000. The incorporators are C. H. Barnes, president; C. F. Wilson, vice-president, and R. W. Jackson, secretary and treasurer. They operate a Schenk drain tile machine, "Cedar Rapids" post molds, Norwalk Mold Company's burial vault molds, Hehn brick press, Blystone mixer and expect to use Hobbs' block machine. They intend purchasing in the near future molds for manufacturing roofing tile,

silos and vases. Would like to hear from manufacturers of waterproofing compounds as they are interested in this product.

Charles F. Lane, Weldon, Ill., will engage in the manufacture of concrete building blocks.

Concrete Products & Building Company, Theo. Smith, president, 2909 Jacob street, Wheeling, W. Va., wants prices on machines for making concrete brick, block, roofing tile, chimney blocks and fence posts. This company recently organized with a capital stock of $90,000 and will erect a new factory building, 60x100 feet.

George T. Stephens and W. T. Frick have formed a partnership for the manufacture of cement blocks in Keithsburg, Ill. They have purchased a site upon which they will erect a new factory building. The new organization will be known as the Keithsburg Cement Block Company.

Madko Concrete Products Company, Washington Bldg., Madison, Wis., is interested in molds for making sewer pipe and vases, also water proofing compound. They now operate a Dunn drain tile machine, Hobbs concrete block machine, National post molds and a Blystone mixer.

You know what a dirty, disagreeable job it is to properly bundle your empty cement sack for returning to the manufacturers. They are worth a dime a piece so you can't afford not to return them, but the job is put off from time to time because no one likes to do it. And after they are tied, if you do the work by hand, you have a loose, awkward bundle that don't handle well and out of which sacks can be pulled by freight handlers thus resulting in shortage annoyance and bothersome adjustment. Why not do the work in a clean, quick, easy, business-like manner? Your returned cement sacks will stamp your place as an up-to-date progressive business firm if you bale your sacks with a sack baler machine. Saves time and labor, dirt and bother. Write for prices and furtherr information to Handy Sack Baler Co., 620 2nd St., Cedar Rapids, Ia., and to Rowe Mfg. Co., Dept. C. E., Galesburg, Ill.

H. G. Roethel & Co., makers of concrete products at Rome, Wis., are giving ornamental work special attention. Their standard lines also include burial vaults and blocks for buildings and farm silos.

The Vermont Cement Brick Co., Bellows Falls, Vt., has been incorporated with a capital stock of $10,000. F. J. De Forge, president; Philias Grignon, secretary-treasurer.

M. C. Robinson is enjoying a prosperous business. He operates at his plant in Girard, Ill., a Schenk drain tile machine, an Ideal block machine, Packard & Perfection mixers and Conklin silo forms.

The Concrete Pipe & Products Co., Hamilton, Ont., Canada, want a superintendent for their concrete products plant. Must be reliable man, with experience in the manufacture by power machines of blocks, sills, tile, pipe, etc., by dry process. Must also have working knowledge of machinery. Write stating experience and salary expected.

The Concrete Products Works, Pine Island, Minn., want to sell fifty Perfection concrete stave silo molds, also pallets. They are in the market for concrete block machine tamper. This company operates an Ideal and Republic block machines, Perfection stave silo molds and a Jaeger mixer.

The Kirchner Coal & Supply Co., Terre Haute, Ind., manufactures concrete blocks. They have a Hobbs machine and a Kent mixer.

The Independent Concrete Pipe Co., Ltd., formed a few months ago by John E. Russell and others of Toronto, has taken over the plant of the B. Blair Co., Guelph. Mr. Blair is president and manager of the new company. John E. Russell Co., Toronto, are general agents for the company, which will manufacture bell-end sewer pipe, pressure pipe, culvert pipe, drain tile and other concrete products. A McCracken machine for the manufacture of cement glazed sewer pipe has been installed and all pipe will be manufactured in accordance with the specifications of the American Society for Testing Materials. The company has secured the right to manufacture lock-joint pipe in Ontario.

To develop and standardize concrete construction, not only in factory and mercantile buildings, but in the dwelling house line, producers in the vicinity of Springfield, Mass., have organized and are booming the Connecticut Valley Cement Products Association. Several organization meetings have been held recently; 14 producers have already joined. Action has been taken to affiliate with the National Concrete Products Association. Decision has also been made to have a standardized block, tested to withstand a pressure of 1,000 lbs. to the square inch, each to bear the stamp of the association. Officers have been elected as follows: President, Michael L. Ahl, Springfield; vice-president, Louis Taddia, Agawam, Mass.; secretary and treasurer, H. F. Davis, Longmeadow, Mass. At the last meeting it was reported the plans under discussion in cities and towns of this vicinity to relieve the acute housing conditions, include use of cement and concrete construction for numerous dwelling houses. Also that the same construction is being called for in extensive factory extensions under way or contemplated in that city and vicinity.

A new building code will be recommended for Wichita, Kans., in regard to cement construction, according to J. A. Dunn, representative of the Portland Cement Association at the meeting of the Manufacturers' Club recently. "Cement building block construction, heretofore, has been considered rotten," said Mr. Dunn. "My visit to Wichita is to advise manufacturers of building blocks how to make them so they may be used with better success in construction work. I understand the building code of this city calls for cement blocks which will stand a test of not more than 200 pounds pressure to the square inch.

The DeLhorbe Concrete Products Co., Oregon, Ill., are making their business headquarters at the former B. H. Thomas creamery plant near the river. The company, as recently incorporated, are all local men. Capital stock, $25,000. President and general manager,, Wm. DeLhorbe; E. B. Jones, vice-president; G. R. Haas, secretary and treasurer. The five directors, E. B. Jones, G. R. Haas, W. A. Etnyre, C. S. Haas, Wm. DeLhorbe.

Ryno & Towne, Wayland, Mich., have purchased the cement block business of Fred Wallace and the

real estate on the site of the old creamery and will manufacture cement building blocks, cement bricks, etc.

The Prairie Cement Products Co., Prairie du Chien, Wis., recently organized, has added a new factory to their rapidly growing enterprise. They have purchased five acres of land adjoining the Burlington tracks and new sidings are being put in for loading purposes.

Work has been delayed on the building, waiting for steel, but will be completed in a few days. The new concrete workhouse is 26x50, built of the company's tile. The workshop is 26x50, two stories high with mixing done on the second floor with American Cement Co.'s "Boss" concrete mixing machines driven by individual electric motors.

A steam plant is located in one corner for furnishing steam for five dry kilns, each 9x90 feet by seven feet high with oval concrete roof. There are two lines of track in each with automatic trucks for handling drying tables.

The capacity of the Hamilton concrete building tile machines is 5,000 to 6,000 tile per day and the Hehn brick machines from 8,000 to 10,000.

The new factory is connected with the old one by side track.

The new factory is now turning out concrete blocks at the rate of 1500 per day. Thirty men are employed and when the factory is complete a much larger force will be required.

A second branch organization of the Nelson Concrete Culvert company at Pontiac, Ill., has been organized. The latest organization has for its title the Nelson Concrete Culvert company of Michigan. The other branch was organized recently in Arkansas.

The Michigan company has been organized with a capital stock of $75,000 with its offices and factory at Kalamazoo, Mich., and has already begun operations.

The directors of the new organization as elected last week consist of A. Kramer, John Eblink, F. H. Stanton, L. P. Mullie, Jacob Zuideman, all of Kalamazoo; Orin Smelker, of Freeport, Mich., and L. W. Nelson, of this ctiy. The officers elected are: President, Adrian Kramer; vice-president, L. P. Mullie, and secretary-treasurer, F. H. Stanton.

The purpose of the new company is to manufacture and sell the well known Nelson pre-cast concrete culvert in the state of Michigan besides manufacturing concrete blocks, brick and tile. The Nelson concrete culverts are meeting with phenomenal success in all parts of the country because of the ease of their installation which does not require experienced laborers, nor many of them, and their exceptionally long life and durability.

J. S. Howell, Louisburg, N. C., wants catalogs and prices on cement brick and building blocks machines and concrete mixers.

The Belknap Cement Products Co., Greenville, Mich., have more unfilled orders on their books today than they have ever supplied in any one year in the history of their business. Quite a large proportion of their orders for silos are from outlying districts and Mr. Belknap advises us he has found it necessary to discontine taking orders from outside sources for silos, and all order for silos for the balance of the season will be taken only from customers in and near Greenville.

Fire on the farm of J. G. Fife, Bloomington, Ohio, not long ago destroyed a barn and several other buildings but left intact the 12x51 foot cement stave silo standing next to the barn. Of course that is what one expects of concrete but this particular fire emphasized the necessity of providing complete fire protection to the silo by equipping it with either a fireproof chute or with fireproof doors. Mr. Fife's silo happened to be empty at the time but had the fire occurred a few days later, after the silo had been filled, the concrete doors with which it is equipped would have given complete protection to his stock of winter feed. Wooden doors would have burned and as a result, part, if not all of the contents of the silo would have been damaged.

As efficient means of fighting fire are almost unknown on the average farm, it is important that every farm building be made as nearly fireproof or fire-resisting as possible, especially when it houses valuable stock food. It is bad enough to lose buildings, by fire but worse to lose their frequently more valuable contents. Mr. Fife's silo was built by the Portland Silo Co., Portland, Ind. This company is convinced that concrete doors are a desirable feature of the silos which it builds.

Austin Crabbs, manager of the Cement Products Co., Davenport, Iowa, reports business very good. They operate a U. S. Champion roofing tile machine, Ideal concrete block machine, Standard Metal Products Co.'s silo molds and a Blystone mixer.

The Poughkeepsie Cast Stone Co., Poughkeepsie, N. Y., has furnished four hundred and eighty white cement columns for a pergola at St. Peter's Cemetery. The bases are 2′x2′x8″ and were dry cast and rubbed. Bases, caps and columns were precast at the factory, and their total height is 10 feet. The reinforcement was projected about 5 feet from the footings, and the columns and bases were made hollow and set over the rods. Concrete was then poured into the columns, encasing the reinforcing, to insure stability. White cement and Conlin & Company's crushed marble were used, producing a pure white, non-staining sparkling effect.

The Shearman Concrete Pipe Company, Burwell Building, Knoxville, Tenn., will erect a factory building, 217x200 feet, at Little Rock, Ark.. to have a daily output of four cars concrete pipe. The plant will be electrically operated and will cost about $50,000, including machinery. They operate a Walter roofing tile machine, Jaeger mixer and Sheerman's block machine.

Vet Pettingill has a modern factory in Rock Rapids, Iowa for the manufacture of concrete products. He operates a Sioux City drain tile machine, Anchor block and silo molds, D & A post molds and a Blystone mixer.

Owing to the great demand for their concrete block machines, the Multiplex Concrete Machinery Company will erect a large addition to their present buildings at Elmore, Ohio. The Multiplex Stripper is a rapid operating machine of large capacity, making two 8x8x16 hollow blocks at one operation. It uses wet-mixed concrete that is stripped out of the mold box.

The Watauga Cement Products Corporation of Bristol, Va., recently organized, capital stock $5,000. W. Smith of Elizabethton, Tenn., is president.

Conlin & Co., Tuckahoe, N. Y., manufactures crushed white stone and marble dust for concrete products, producing a pure white-non-staining sparkling effect. Adds little to the cost and increases your profits. They will gladly send any of our readers samples of their material and quote you prices.

Combining the durability of cement and the strength of steel into columns with all the beauty of stone and the lightness of wood, the Trusswall Company, Peoria, Illinois, are making columns to any specification up to 40 feet in length, any diameter. They are monolithic, have no joint or mold marks, and are really a work of art.

"Trusswall" columns are hollow, with cement walls reinforced with steel, and during construction each column is turned on an adjustable lathe, insuring a perfect and even finish. Any desired detail or design can be executed with minute exactness, even to the color or likeness of any stone.

The aggregates are very carefully selected and screened to sizes, and definite portions are always used. For example: 135 lbs. crushed Bedford stone, 135 lbs. crushed St. Peter's sandstone, 35 lbs. White Cement, 35 lbs. Portland Cement, 12 lbs. hydrated lime, 2 lbs. color, 7 lbs. waterproofing, and the water is also weighed for each batch. The Trusswall Mfg. Co.'s plans at Kansas City, Mo., will be greatly enlarged this spring. The company manufactures most of the ornamental concrete columns, urns, pedestals and railings used in Kansas City territory.

The concrete products factory of J. W. Stewart, La Porte City, Iowa, was recently destroyed by fire, which was caused by a spark from the gasoline engine which is used for operating the mixer.

Isaac Grogg of Auburn, Ind., operates a very prosperous and modern factory for manufacturing concrete products. They have a Dunn drain tile machine, seven Ideal block machines, forty-two D & A post molds, one Ideal brick machine, three Raber & Lang sewer pipe molds and two Raber & Lang concrete mixers. Mr. Grogg is the in the market for waterproofing compound in a powder form.

William H. Pickering, Spencerville, Ohio, is a large producer of Concrete products. He operates a Dunn drain tile machine, Miles block machine, Norwalk Mold Co.'s burial vault molds, Dunn sewer pipe mold and Waterloo concrete mixer.

Schafer Brothers, Rochester, N. Y., are increasing the capacity of their concrete products factory and are erecting a new factory building on Chili avenue. They have ordered a Besser power block machine and a Besser power brick machine, two batch mixers and a forty-eight Chase roller bearing brick cars, rails, etc. They have been operating a Century block machine, Peerless brick machine, Ohio post molds, Monsco silo forms and Besser, Kent, Blystone and Smith mixers.

"Improving Cement Products" is the title of a new Bulletin No. 302, just issued by the National Lime Association, Washington, D. C., which they will gladly send to any of our readers. It is a discussion of the properties of various types of concrete products, and the relation which hydrated lime bears to their development. The eight page booklet contains the following extracts from letters of users of hydrated lime in cement products:

From Joseph V. Godfrey, Moorhead, Minn.—"I now use 1½ sacks of cement and 20 pounds of hydrated lime to 6 cubic feet of sand and make a block that at thirty days old you have to use a ten-pound sledge to smash. There are many advantages to hydrated lime in blocks."

From Pittsburgh Building Materials Co., Pittsburgh, Kansas.—"We had occasion a few days ago to examine some cement blocks made about a year ago in which hydrated lime was used in proportion of 1 to 4 and the blocks appear harder, denser, and of a better color than those in which no lime was used. We are now making some fancy columns, mixing with hydrate."

From a prominent manufacturer of cast artificial stone in New England.—"That its use is an absolute prevention for efflorescence we do not know, but we do know that with its use and the treatment which we give the surface of our product, we do not have efflorescence, *and we are convinced that we could not turn out the high class product that we do without the use of hydrated lime* and we make this statement in selling our product that very few concern do make, viz., our cut cast artificial stone runs true in grain and color—does not show efflorescence. Our average compression test is 4500 pounds to the square inch and our absorption is less than 4½ per cent.

"If you care at any time to refer any inquiring friends to us with reference to the use of hydrated lime in cut cast stone, we should be more than pleased to give them any information we possess."

The Peninsular Art Stone Co., C. A. McPherson, president, Box 414, Phoebus, Va., operate a Helm brick machine and a Helm mixer. They expect to add drain tile, fence posts and roofing tile to their business.

The Davis Coal & Block Company, S. Ritter & C. J. & W. Ry., Indianapolis, Ind., advise they may possibly use an Ideal concrete block machine. Now operate a Kent mixer.

"Micasper and How to Use It" is a new booklet recently published by the Crown Point Spar Company, 663 Broadway, New York, N. Y., manufacturers of mica spar crystals for stucco dashing and concrete block facing. They will gladly send any of our readers a copy of this booklet, with free samples of mica spar crystals.

Lafayette Lumber Company, Lafayette, La., manufacture concrete products. They operate a Walter roofing tile machine, Ideal block machine and Northwestern cement post molds. Have no mixer.

The Gale Sand Company, Gibson, N. C., operate a Selm brick machine and an Elite continuous mixer.

Rib-Stone Concrete Corp., Inc., Batavia, N. Y., has issued a folder describing the use of Rib-Stone staves in silo construction. This company guarantees its silos for a period of 10 years to keep silage perfectly under all conditions, to be absolutely air and moisture-proof, free from defects in material and workmanship, not to fall, lean, blow down or to be wrecked by storms other than tornadoes and cyclones. This guarantee covers concrete only. They operate Playford silo molds and a Blystone mixer and are interested in machines for making brick, fence posts and drain tile.

L. D. Shannon has purchased the Lebanon Cement Tile & Block Co., Lebanon, Ind., and is operating a Dunn tile machine, Ideal block machine, Besser and Springfield hand brick press and a Blystone mixer.

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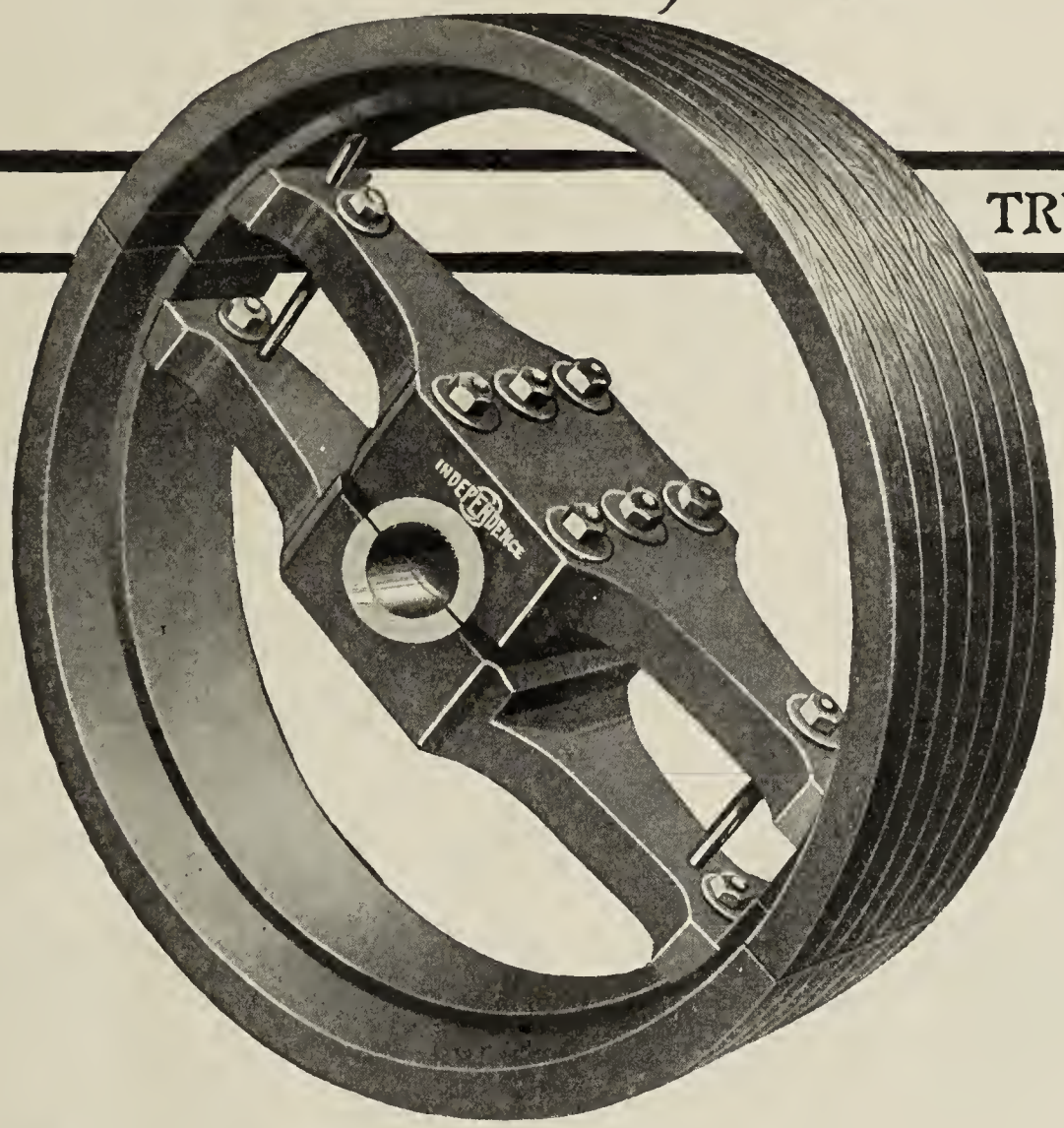

A Dodge wood split pulley is lighter and more carefully balanced than any metal pulley; the tractive pull of a belt on a wood rim is greater than on an iron or steel rim; and you can expect a quicker delivery of both stock and special sizes of wood pulleys than is possible of any other type.

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Canadian Plant: Dodge Mfg. Co. of Canada Ltd., Toronto and Montreal

Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark

N. V. Poindexter, Box 101, Elkins, N. C., wants names and addresses of manufacturers of cement, brick and block machines. He writes us as follows: "I am thinking of making concrete blocks and brick, though it will depend on cost of machinery and material. I am now trying to get prices so that I can calculate cost of plant and material."

John W. Pelot, Arcadia, Fla., is interested in cement brick machines and would like to receive catalogs and prices.

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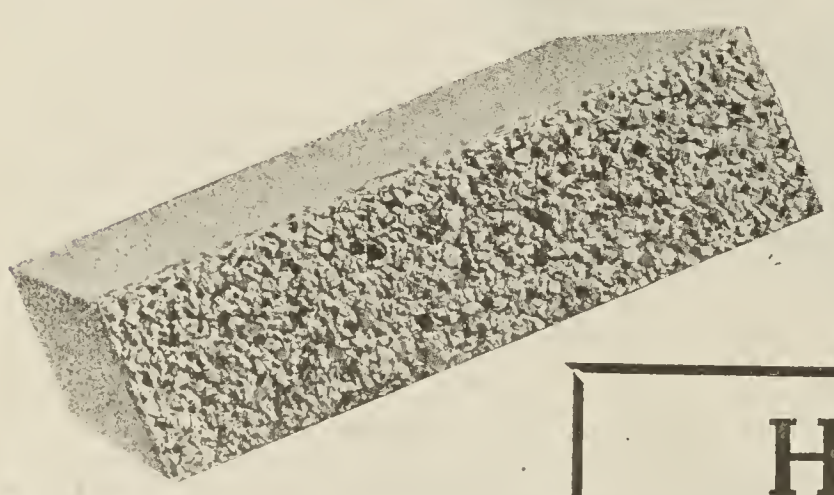

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Cement and Engineering News

Vol. 32 Chicago, June, 1920 No. 6

Delivering Concrete by Gravity

This illustration shows the method employed in San Francisco in placing concrete for concrete foundation on steep hillsides.

The concrete mixer is placed at the top of the hill, and sectional wooden chutes are extended from the mixer to the base of the street. The concrete is delivered to the base first, and as the work progresses toward the top of the hill, the sections of the chute are removed.

Editorial

Industrial Democracy

Cordial, friendly, co-operative—and mutually profitable—relations can be established between employers and workers and Albert S. Bond, president of the Packard Piano Company of Fort Wayne, Ind., employing 300 men demonstrates that it can.

Mr. Bond is not satisfied to stop at the satisfactory stage already reached in establishing cordial relations with his men. Industrial Democracy, to his mind—as indeed to the mind of its author, John Leitch—can be carried a number of steps further as conditions ripen.

"I want to have every man a stockholder and to have the men represented on the board of directors," Mr. Bond recently declared with great emphasis. "Then men who do the work and help to make a business a success ought to be regarded as the most valuable part of a concern's assets. Efficient, willing, satisfied labor is to be reckoned as the highest form of capital. Of course, money capital is absolutely essential and must be treated fairly, or failure would result ultimately.

"The ideal arrangement, and one which will probably come sooner or later, would be for capital and workers to share fifty-fifty in all profits after wages and a fair return on capital have been taken care of. There can never be a maximum of progress in industry or in our whole social life until the workers who bring about increased production or lower costs participate equitably in the financial benefits.

"After all, employers are beginning to realize that neither they nor their business will be regarded as successful, no matter how much money they may make, unless in the making of it they produce workmen who are a credit to themselves, to their business and to the nation. The mere building up of a fortune by hook or by crook, and with scant regard to the well-being of workers, affords no high order of satisfaction, but the building of men yields worth-while gratification and happiness.

"Industrial Democracy, I can truly say, after six years of experience with it, has made life better and broader and happier both for me, as an employer, and every worker in our establishment."

Be Prepared

We believe it is one of our advertisers who has made the statement that "the mixer is the heart of any piece of concrete construction."

That is not merely an advertising talk, either. Anyone will see the logic of the statement if he considers for a moment that practically all operations must stop, if the mixer breaks down, just as all the bodily functions must stop, if the heart ceases to beat.

The simile cannot be carried too far, however; for while a human being cannot have two hearts, so that one can be brought into operation when the other becomes disordered, a man may, and the wise ones do, have two mixers, one of them standing around ready for emergency, believing that an idle mixer is not as great an expense as a bunch of men made idle the moment that concrete ceases to flow.

A few days ago we saw a mixer standing idle in a concrete products plant, ready to be brought into action the moment that there might be a breakdown of the main equipment. This looked to us like good business; for have we not seen many times almost the entire force of a plant standing around with their hands in their pockets waiting for the mixer to mix? We remember, too, that the contractor who has made the most rapid and consistent progress on the concrete road work in Vermillion County, Illinois, has an emergency mixer constantly standing at the side of the road ready to be brought into play if an accident should happen.

Some people who are willing to take chances say that having an emergency machine on hand is simply one way of courting trouble. But we notice that the men who are willing to invest this extra amount of money are prospering amazingly.

Blasting Accidents from Missed Holes

An Open Cut Blasting Accident

Accidents caused by missed holes occur both underground and in open cuts. Many of them are avoidable and attention to the details of such accidents should make it easier to avoid them in the future. The following report of an accident, occurring in some open-cut steam shovel work, in which two men were killed, should serve as a warning in operations where any uncertainty exists about a missed hole and where black powder is being used. The accident referred to, occurred in an open pit copper mine in Utah.

The height of the face at the cut is about 30 feet. Twenty 1¼-inch vertical holes 30 ft. deep were drilled at the time and chambered with about 50 sticks of 1⅛-inch dynamite. After this, they were loaded with 8 or 10 cans of black powder in each hole, and exploded with an electric battery. The debris was then being removed by a large steam shovel. At the time of the accident the dipper was working on the right side of the cut, the boom being turned to the right The engineers and cranemen were in their places, both being on the right hand side towards the shot. When the dipper was just starting at the grade, to take a load, a flash was seen, followed by an explosion a few seconds later. Most of the men ran under the shovel, two or three did not quite get out of danger and were slightly hurt. The positions of the engineer and craneman were such that there was no chance for them to escape. The engineer's body was found lying on the cab floor, and the craneman's body was found between the cab and boom beam, both being killed by the fall of blasted rock.

This seems to be a clear case of a missed hole, exploded by sparks from the steel dipper. One of the pitmen, said they all saw a flash and all ran for the shovel.

The formation at the surface is full of cracks and crevices. Also, the springing of the holes would naturally open cracks. The explanation of the cause of the accident is that, when loading the black powder, some of the powder ran down one or more of these cracks and filled a small opening not far from the loaded hole; at the same time, leaving a trail of powder from one point to the other. This explains the lapse of time between flash and blast. Sparks from the dip-

per just as it reached the powder caused the trouble.

The foreman and the pitmen all say they often seen unexploded black powder in small quantities among the rocks, but that no flash has been seen before; also, that this was the first missed hole they have known of, though most of these men have been on the job only a month or two.

This accident emphasizes the necessity of careful search of any place where blasting has been done for evidence of missed holes. In the cases where black powder is used the injection of water would serve as an effective preventive of an explosion.—U. S. Bureau of Mines, Reports of Investigations.

Contractors and Their Bonding Companies

By C. H. Bancroft

The Etna Casualty and Surety Co., Columbus, O.

Did you ever consider the many advantages that come to a contractor by establishing close and intimate relations with his bonding company? Doing so eliminates much of the trouble experienced at times by some in obtaining bonds promptly and easily.

Practically all United States Government, state and municipal work is required by law to be bonded, and the practice is growing of railroads, other corporations, and private owners asking for bonds for construction work. In all cases the reason is the same; the owner recognizes that construction work as a class is hazardous, that on account of many varying conditions its cost cannot be accurately foretold, and that some doubt may exist as to the ability of the contractor to successfully complete the contract in accordance with the specifications, and he therefore seeks to safeguard himself against these uncertainties by requiring the contractor to give a surety bond that he will faithfully complete the contract and for the price or prices named. The owner is expected to let the contract to the "lowest responsible bidder" and if the lowest bidder is able to get a bond he often accepts the same as definitely establishing his responsibility.

Unfortunately, some few irresponsible contractors are able to hunt up a bonding company that will write them without investigation, whereas an investigation would perhaps disclose them as being wholly without resources, plant or ability and a decidedly poor risk for a bonding company. They will often bid ridiculously low in order to surely land the contract, knowing that they are actually bankrupt at the time, but hoping that the new contract will in some way supply them with funds which can be used to retire the most pressing obligations on their other work. They have everything to win and nothing to lose in a bid of this kind. The responsible contractor, and it is to him that this is addressed, suffers because the irresponsible ones can more or less continue in business. the surest and quickest way to eliminate the irresponsible bidder is for all responsible contractors to encourage the bonding companies to make thorough investigations of all bond applications by furnishing them full information about the work and their resources whenever they desire a bond. They can stand it while the others cannot.

"Treat your bonding company as you do your banker" is a very good axiom because they both sell you the same thing—Credit. The same intimate and confidential relationship should exist and it is greatly to the contractor's advantage to keep his bonding company fully informed as to his affairs so the latter is always in a position to promptly write a bond up to the full limit of the contractor's resources. He may take on a very much larger contract than usual and his standing as a contractor is greatly enhanced if he is able to furnish his bond quickly. The bonding company can only do this by having adequate information already on file. This is especially advantageous when a bid bond is applied for, because the time is often short in which to negotiate one.

The bonding company and the contractor are in a way partners in the undertaking, and the bonding company wants the same kind of information about the contractor, his financial strength, the adequacy of his bid, the skill of his organization, etc., that anyone else would want if invited by the contractor to participate in the undertaking by putting into it a large sum of money. The are both vitally interested in the work going forward, and at a profit consequently it is to the contractor's advantage to have associated with him a large bonding company of great financial strength. Should it happen that difficulties are met, the bonding company may be able to help him work out the difficulties and keep things moving to a successful completion of the work. The contractor should notify his bonding company at once if he is in trouble.

There is another maxim in connection with this business that is not without interest to the contractor. I refer to what I believe should be the attitude of the bonding company toward difficulties and it is expressed as follows: "Always run toward trouble and not away from it." The owners and contractors are alike interested in the attitude of the bonding company on this question and the service it is able to render if called upon. The subject will bear investigation before a bond is accepted by the owner or applied for by the contractor. Years ago some surety companies never took a loss except at the end of a law suit in which the flimsiest technicalities were often put forward as the reason for not accepting a responsibility. I am very glad to say that such an attitude is rarely met with at the present time, still some bonding companies are decidedly lukewarm in the way they approach or go after anything that might possibly develop into a loss to them.

Bonding, like the banking business, is based, developed, and thrives upon the mutual confidence and esteem of the interested parties. Its great development during the past few years is sufficient proof that in general there exists the most cordial and intimate relations between contractors and their bonding companies. Neither party can go very far forward without it.

American Construction Materials Needed By Brazil

Brazil offer a market for all kinds of construction materials and machinery, not only in the immediate future but for an indefinite time to come, according to Trade Commissioner W. W. Ewing, whose report on that country was issued today by the Bureau of Foreign and Domestic Commerce, Department of Commerce. Mr. Ewing recently returned to the United States after a tour of investigation covering all the South American Republics. He is convinced that Brazil, by reason of its vast undeveloped territory and its immense resources, is rapidly increasing in importance as an export field.

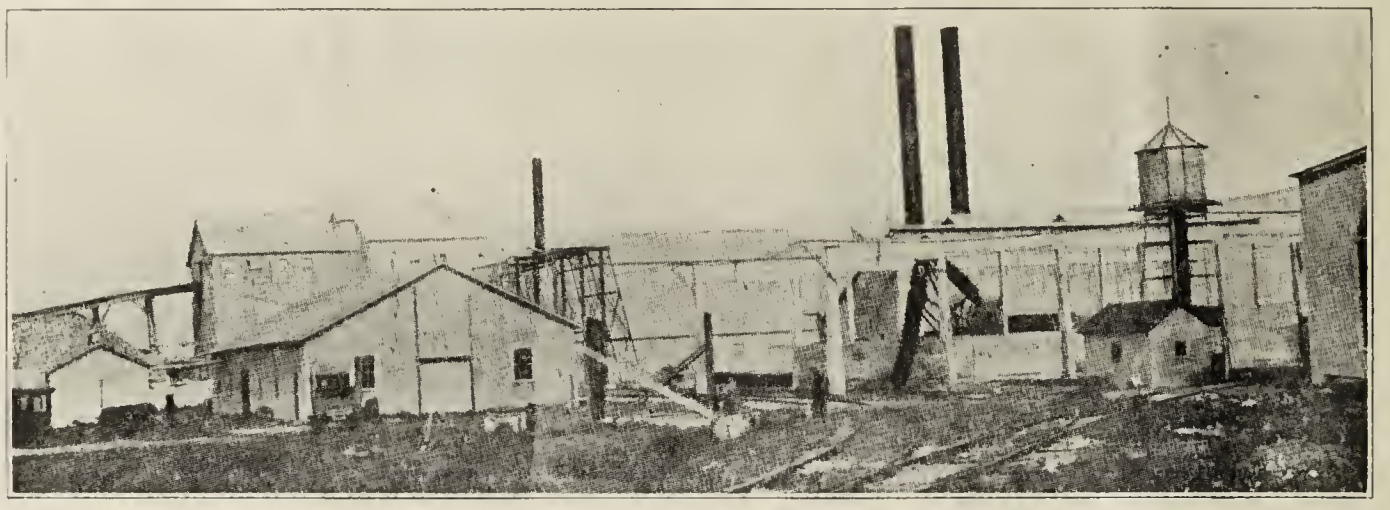
There will be a good market in Brazil for Portland cement. More than 2,500,000 barrels of this product were imported in 1913.

The Gilmore Cement Mill

The Gilmore Portland Cement Corporation, Gilmore City, Iowa, will materially increase their output in 1920 and it is arranging to put in additional machinery to double the present capacity, including three kilns and grinding, conveying and elevating machinery.

The Gilmore plant is equipped with the latest machinery, and capable of turning out 1,500 barrels of cement per day of 24 hours.

The company owns 126 acres of land which is underlaid with limestone to a depth of nearly 200 ft. The top soil is only 4 ft. deep, which makes quarrying very easy. Best of all, this top soil is fine shale containing the necessary elements needed to go with the limestone for the making of cement so that the company has practically all of its raw material right on the ground.



General View of Gilmore Cement Plant, Gilmore City, Iowa.

Quarry Operation

The stone is white, hard limestone, easily shattered with dynamite. The quarry is operated in long canal-shaped cuttings, extending straightaway from the foot of the incline leading up to the crusher. Stone is being taken out to a depth of about 26 feet. The drilling is done by Armstrong drills. One of these drills has been in use in the quarry nine years. It was the first machine manufactured by the Armstrong Co. It strikes 67 to the minute and carries 1,300 lbs. of tools. The second drill has been operated four years. One man does the drilling, making an average of 35 ft. a day. The drilling is kept about 100 ft. ahead of the shovel. Holes are drilled about 16 ft. from the face of ledge and six are fired at a time. From 75 to 150 lbs. of 40 per cent dynamite is used to each hole. The stripping is done by a 45-ton Vulcan tractor shovel with 1¼ yd. dipper. The shale is loaded into dump cars and taken to the receiving bins above the drying pan in the cement mill. The stone is also loaded into dump cars by a 70-C Bucyrus 85-ton steam shovel with 2½ yd. dipper. Two 15-ton 9x14, 36-in. gauge Vulcan locomotives are used in the quarry. Twelve metal industrial cars, 10 wooden dump cars of a special type and 10 side dump cars are used to haul the shale and rock. From the foot of the incline the loaded cars are pulled to the crusher house by cables, ¾-in.-6x19. The electric hoists are operated by motor, variable speed. The incline is 18 degrees and 300 ft. long. Cars are brought up three at a time, each holding 3 tons. Stone and shale cars run on parallel tracks.

The Crusher House

The stone cars are automatically dumped into a No. 9 Gates Gyratory crusher which has now been in use nine years without being touched. From the No. 9 the stone goes by gravity to two No. 5 Gates Gyratory crushers passing over a "grizzly" on the way, which allows the fine stone to drop through and go direct to the elevator without passing through the No. 5s. All three crushers are anchored to the solid rock.

After passing the crushers the stone is elevated by Allis-Chalmers bucket conveyor to two sets of Allis-Chalmers 42x16 in. screens over the commercial rock storage bins. The large sizes drop into the commercial rock storage bins and the fine material passes to bins from which it is fed to the dryer by screw conveyors. The rock bins are also tapped by a special screw conveyor which feeds a Model 3 Williams mill. This makes it possible to take rock from the commercial storage bins, recrush it and send it on to the dryer to be used in cement.

Handling Shale

When the shale comes up the incline into the crusher house it is discharged onto a belt conveyor which carries it along to the storage bins, adjacent to the rock bins. From these it passes by gravity to a 9-ft. dry pan made by the American Clay Machinery Co. From the dry pan it drops to a pit from which it is elevated to a 32-ft. dryer. From the dryer it is discharged into a pit.

Weighing In for the Finish

Both clay and stone, after passing through their respective dryers and discharging into the grab bucket pits are picked up by an electric trolley crane which handles a 1½ yd. steel bucket, and carried to the weighing scales. The weighing is done on the basis of 1,500 lbs. of rock with shale in such proportion as determined by analysis.

All Ground Up

The scales dump the material into a grab bucket pit from which it is once more taken by the overhead grab bucket and conveyed to the concrete storage bins over the Sturtevant mills. A Sturtevant duplex and a Sturtevant single are used. The material is ground to a 70 per cent fineness and elevated to two Sturtevant Newaygo separators where it passes through a 40-mesh screen. Material rejected by the screen goes back to the mills for regrinding.

The Tube Mills

From the screens it is elevated to concrete storage bins above the tube mills. Two steel-lined, pebble type mills are used. They are 6 ft. diameter by 22 ft. long. In these mills the material is reduced in fineness 95 per cent on a 100-mesh screen. From the tube mills the material goes by screw conveyor and elevator to the storage bins ahead of the kilns.

The Kilns

There are two kilns 8 ft. in diameter and 125 ft. long, capable of producing 1,500 barrels of clinker every 25 hours.

Coal for burning in the kilns is delivered by two 12-inch coal burners, especially designed.

The coal is broke down in a No. 1 Williams mill, and dried in a Matcham coal dryer. It is pulverized in a 42-in. Fuller mill operated by horizontal motor.

The Bucyrus Steam Shovel Used in the Gilmore Quarry

The clinker discharges from the kilns into a clinker pit from which it is taken by an overhead traveling electric crane with a 60-ft. span and placed in the storage bins to cool and age. The bins are 60 ft. wide and 150 ft. long with walls 12 ft. high. The clinker is allowed to age about two weeks when it is again taken by the grab bucket and deposited in bins ahead of the weighing scales where the proper amount of gypsum is added. It is then elevated to concrete bins above a duplex and a single Sturtevant mill into which it passes by gravity and is ground to 80 per cent fineness.

The Final Pulverizing

From the mills it is elevated to four Newaygo separators, the rejected material going back to the mills. After leaving the separators the material is elevated into concrete bins ahead of two tube mills, 6 ft. in diameter by 22 ft. long, steel lined and using 7/8-in. steel balls for grinding to a fineness of 80 per cent on a 200-mesh screen. It is now finished cement and goes by screw conveyor and elevator to the stock house. Hourly samples are taken and tests made both of raw material and finished product.

Stock House

The stock house is composed of eight reinforced concrete bins 20 ft. in diameter and 60 ft. high and also three inner bins formed by the walls of the circular bins. The cement is drawn from these bins to a belt conveyor which deposits it in bins over two Bates Valve Bag Machines. From the machines the sacks are trucked to the car. There are two tracks running parallel to the loading platform for loading.

All machinery is electrical driven from the power plant at which the electricity is generated by one 200 KW alternating current, direct connected Allis-Chalmers engine, and one 1,000 KW alternating current, direct connected Allis-Chalmers engine, and one 125 horsepower, high-speed engine which is used for direct current purposes and lighting of the entire plant. These engines are all run condensing. The boilers are four 325 horsepower. The buildings are steel frame on concrete foundation with galvanized iron siding.

The plant is located on the Minneapolis and St. Louis Ry., and the company owns all switches and tracks on its property.

A Greatly Improved Deep Blast Hole Drilling Machine

The "American" Gearless Blast Hole Drilling Machine, manufactured by the American Well Works, Aurora, Ill., has been developed after nearly a half century's experience in building deep drilling machines to meet the modern requirement of large capacity deep blast hole work.

The machine is built close to the ground, nicely balanced, and has ample strength of frame to carry the working parts in perfect alignment when operating a heavy string of tools at the high speed now required in quarry blast hole drilling.

While the normal speed of drilling is 50 strokes a minute, this machine will jump the tools smoothly at 60 strokes, handling with ease a 4-in. diameter by 20-ft. length drill stem equipped with bit and socket weighing from 1,100 to 1,200 lbs., and drilling 5⅝-in. or 6-in. holes.

The spudding beam is attached to the rank in such manner that it gives a quick, hard stroke of drill at a speed of 50 to 60 r.p.m., with less whipping of cable than other machines for this purpose.

There are no clutches on the machine; the crank is keyed fast to the crank shaft, and the tools are always the full length of the stroke off the bottom when stopping, permitting them to start on the down stroke with engine or motor at full speed without backing up.

Their catalog shows one of these machines, used to drill deep blast holes through the overburden for stripping the cement rock, after which, the machine is used in drilling the cement rock for mining by the open quarry steam shovel method.

Among the improved features of this machine is a device for starting and stopping which eliminates slowing down when changing from drilling to running out or in, cable and sand reels driven by friction, great simplicity and rigidity of construction and ease and convenience of control.

It's a machine everyone interested in the highest development of deep blast hole work should investigate.

Is There Need for Further Standardization in American Construction Activities?

An Address by Mr. Ernest T. Trigg, President of the National Federation of Construction Industries, Before the Engineers' Club of Philadelphia

I. What Has Already Been Done in the Establishment of Standards in the Construction Industry?

For half a century America has been developing technical, manufacturing and commercial standards. The direct result of all this is the pre-eminent position occupied by American industry because of manufacturing on a quantity basis. There are few makers of automobiles who do not confine themselves to one or two standard models of cars. By so doing they are enabled to reduce the cost of production, and by the volume of production to distribute overhead costs among a greater number of cars.

It is a fact, however, probably caused by the peculiarities of the business and the complexity of the relationships involved, that the manufacture of the materials entering into construction is less standardized in some instances than the manufacture of materials for other industries. Much, however, has been done. A decade ago eight days were required to install a bathroom which today can be put in completely in four days. There is a building in New York City twenty-two stories high, one hundred foot frontage and a full block in depth. The iron work of this building was put up in eleven days, at the rate of two stories a day, and the brick work was completed in twenty-two days, at the rate of one story a day.

Only a few years ago each manufacturer of materials on which screw threads were used had a special thread for his products. The manufacturer of pipe fittings for gas meters used a thread made by no other maker, on the policy that, if a gas company once purchased his pipe and fittings, the company would be forced to continue to patronize him because he was the sole maker of that kind of thread. Now, through nation-wide standardization, the same thread is used on all gas meter pipe and fittings. Further, the Briggs (or American) Standard screw thread is in common use throughout the United States on manufactured articles carrying threads; and a strong concerted effort will be made by the American delegation at the International Screw Thread Conference in Paris on November tenth to have the American Standard for screw threads made the International Standard.

The United States Geological Survey states: "It has been suggested that failure to recognize a certain minimum thickness for slates has been unfavorable to the industry; that some producers are in the habit of splitting their slates too thin, and that the insistence by architects and the general public on thicker slates would result in much less breakage, a higher standard of splitting and sorting slates, and the marketing of a product of higher grade. The minimum suggested is 3-16 of an inch." This thickness for roofing slate has become an accepted standard.

A large amount of technical and material standardizing has been done by the engineering societies along lines directly concerned in the construction industry. Standards have been worked out for ferrous metals, non-ferrous metals and alloys, cement, lime, gypsum, clay products, paints, oils, varnishes and many other materials.

Many contributions have been made to the construction industry through the development of a Standard Boiler Code, Fire Protection and Safety Codes. Standard Cost Accounting Systems have come into use in some branches of the industry, notably for Paint, Varnish and Dry Color Plants. A beginning has been made in standardizing business practices and ethics.

It is impossible within the limits of this paper to offer appreciative testimony to all the widely diverse professional and trade associations which have contributed toward standardizing the construction industry. A thorough foundation has been laid by the standards already adopted and in use. In fact, if the work of the past fifty years had not been done on such wise, broad and sound principles, it would be much more difficult to set out upon a program of standardization which, it seems to many of us in the construction industry, may now be properly commenced.

II. What Is Embraced Under Construction?

The construction industry embraces the construction of residences, warehouses, factory, office and other buildings; roads, streets, railroads, bridges, docks, tunnels, dams, waterworks, sewers and other public works; dredging, irrigation, wrecking and remodeling; the production, manufacture and distribution of materials, equipment and machinery entering into or used in connection with construction.

III. What Are the Interests Concerned?

The interests directly concerned in the construction industry are producers of raw materials used in construction, manufacturers and distributors of construction materials, contractors, sub-contractors, engineers, architects, building and highway commissioners, realty and mortgage bankers, insurance companies, real estate developers, building and loan associations, fire protection organizations and other professional, commercial and industrial interests connected with construction or real estate development.

The construction industry is the largest industry in the world. It includes, roughly, one-third of the business firms of the United States. It normally produces three billion dollars of additional permanent taxable wealth in this country annually, in the form of buildings, highways and other architectural and engineering projects. It stands practically alone in the creation of facilities for the production of additional wealth. It furnishes more than one-quarter of the railroad tonnage and employs more men than any other business in the country, excepting agriculture.

IV. What Are the Arguments for and Against Standardization?

The arguments for standardization are:

1. It permits of manufacture on a quantity basis.
2. It makes it possible to produce a supply during the slack season, thereby tending to prevent seasonal employment, decreasing labor turnover and facilitating prompt delivery.
3. It reduces maintenance cost and makes repair easier.
4. It eliminates poor design and unsatisfactory supplies.
5. It reduces the labor and machine costs, both at the factory and at the site of erection.
6. It makes possible closer co-operation between architects and engineers and the men who produce, distribute and install material and equipment.
7. It assures a uniform degree of safety and efficiency during and after construction.

In a word, a properly executed program of standard-

ization in the construction industry appears to point the way to a better service, from the standpoint of both the construction interests and the consumer, and to reduce cost.

Arguments against standardization are:

1. It limits efforts to make pleasing designs.
2. It limits choice.

In answer to the objection that it limits efforts to make pleasing designs, it might be said that standardization applies more to the constituent parts of building than to the whole. It seems unlikely that standardization would ever be carried to the point of limiting pleasing designs for buildings.

Regarding the matter of standardization limiting choice, so long as standardization eliminates only the bad, the unnecessary and the superfluous, choice in the real sense of the term is not limited. It is quite likely, no matter how far standardization may ever go, that there will be people in the world who will want to pay the price for excessive individuality, and it is just as likely that it will continue to be for sale.

V. What Additional Standardization is Needed?

The directors of the National Federation of Construction Industries feel that there may be a need for developing a code of American Construction Standards. The Federation is a national organization including in its scope the entire construction industry. I might say that at present the Federation's plans for this work are in a more or less fluid state. We think there is real work to be done and would like to know the feeling of others on this question. It assuredly is not the purpose of the Federation to preempt the function of anyone else or to prepare the proposed standards first hand. The standards would of course be prepared by those best qualified to do so and the Federation would act as a clearing house through which the standards would be gathered together.

It may be found that additional standardization needed in the construction industry may be classified under the following heads:

1. Engineering Standards, including chemical and physical compositions of raw materials and technical dimensions, illustrated by the work already done on screw threads, etc. Such engineering standards in many cases have already been developed through the work of the engineering societies. Such of these standards as refer to the construction industry would be adopted by the Federation after consultation with all interests concerned, and proper credit would be given for the development of the standard. I believe that engineers generally feel that much work remains to be done along the line of engineering standards; and as new standards appear, they would be considered by the properly constituted body in the Federation and would be adopted if found satisfactory from the point of view of all concerned. A procedure such as this would add the weight and publicity of the Federation's approval to engineering standards and would go a long way toward speedily getting the standards into common use in construction activities.

2. Commercial Standards: In the field of commercial standards much less has been done than with engineering standards, and it is here that a widely representative commercial organization, rather than a professional or technical society, must take the lead. There are many matters along this line claiming the attention of the construction industry at this time, and a few examples of which are given below:

Freight Elevators: At present the freight elevator manufacturers of the United States are making about thirty-three different kinds of freight elevators; some models vary from others only in inches or fractions of inches and have but slight differences in speed. The manufacturers say that a much smaller number of types will fill all commercial requirements. If freight elevators are standardized, the manufacturers can keep their factories running and build up a stock, whereas now they tend to custom-build the elevators to order; and the elevators can be secured in less time at smaller cost.

Slate Slabs: There is said to be a need for establishing standard sizes of slate slabs for structural purposes and also for a better general understanding of the slate industry, so as to prevent specifying "clear" (that is, free from veins and ribbons) because only about 20 per cent of slate slabs can possibly be cut "clear." If I am correctly informed, the adoption of standard sizes of slate slabs for structural purposes would permit slate manufacturers to operate at full capacity during the working season and therefore to supply builders without delay during the entire rush season of building erection.

Concrete Culvert Pipe: The construction of both railroads and highways is intimately tied up with and, to a large extent, dependent upon the standardization of concrete culvert pipe, which is now being worked out through the combined effort of a number of engineering and commercial organizations.

Tile: D. Knickerbacker Boyd in "The Architectural Forum" for July says: "No one who has not actually visited a tile plant and kilns can begin to realize the enormous amount of handwork, burning, handling and sorting which is bestowed upon the regulation of white tile, which when finally in the wall or on the floor has such a machine-made and uniform appearance.

"One cannot but wonder when viewing the large force of people sorting tile why the slight variations in shade, said by some to be over forty, should not be taken advantage of on the score of appearance alone, instead of causing this labor and expense to be put into the process that custom seems to have established as necessary. Does the end justify the means?

"And if it were understood what countless numbers of bases, corners, angles and other parts must be made to accompany each size and shape of tile, the presence range of choice in the units comprising a plain white field would be reduced to the rejoicing of all concerned.

"And just as it is impossible to produce all perfect specimens and uniformity of size in any product resulting from concentrated heat, so would the situation be immeasurably helped if so-called firsts, standards and seconds in tile were to be appropriately used. Truly, it is a waste of energy and money to use the best specimen of kiln production in lining an elevator or other shaft or similar features in a building, or portions where light and sanitation are as well served by using the grades remaining after the selection of those more nearly approaching perfection has been made."

Bricks: Just as in the case of tile, it works an economic hardship for specifications for brick to require their being "of first quality only, free from imperfections, blemishes, defects," etc. One-quarter of the brick manufactured would have to be thrown away if only hard-burned brick were specified. The question of a standard size for bricks is one that has received much attention. It is difficult to solve, because brick machines get larger from long use and there is a lack of uniformity regarding the effect of burning on size.

Mortars and Joints: I am told that within certain ranges of climate, mortars and joints should be standardized instead of varying as at present according to individual judgment.

Lumber and Mill Work: The lumber trade associations have worked out grading rules which have established a number of lumber standards. For finished lumber, and particularly for mill work, however, it is said that there is an almost untouched field for standardization. There appears to be real need for standardized

doors, windows, trims, mouldings and built-in closets, and other furniture of various kinds. A beginning has been made in this work by some manufacturers. Such standardization, including perhaps the completion of the various units at the factory, would eliminate much labor incident to finishing at the point of erection. A few days ago I was talking with a gentleman who has just returned from Switzerland, where he was quite impressed by the way the Swiss manufacture their doors and ship them complete, even including locks, knobs and hinges, to the building site.

It has been suggested that waste products of lumber mills might be worked up into short pieces of standard dimensions for those parts of construction where longer pieces are sawed up into short pieces at the point of erection. This would result not only in a saving of material, but also in the labor employed by the contractor.

A great many other commercial standards, the needs for which have manifested themselves, might be mentioned, but the above rather heterogeneous list will convey an idea both of the extent of the needed standardization and the great diversity of the commercial standards that might be developed.

3. Standards of Business Practice: Business practice standards sound abstract, while engineering and commercial standards appeal because of their concreteness. It is, however, not an overstatement to say that more business reverses and actual failures have been caused because of the lack of standards in this field than because of a similar lack in any other. Some business practices that would lend themselves to standardization are:

Oost Accounting: The Saturday Evening Post says, editorially: "Of all the handicaps that retard business success none is more serious than the ignorance of manufacturers in the matter of production costs. The Federal Trade Commission reports that in the United States only 10 per cent of our industrial establishments know what it actually costs them to manufacture their products; 40 per cent simply estimate their costs, and 50 per cent have no method whatever of finding out what their production charges really are. This condition is largely responsible for a national situation where more than one-third of our 300,000 manufacturing companies did not earn 1 per cent on the billions of capital invested in them.

"One of our leading authorities on shop efficiency contends that with correct equipment and proper instruction, the average workman will do at least three times as much as he now does, and can continue to do this greater work month after month. One large automobile manufacturer called on science to modernize his methods, with the result that certain of his costs were reduced two-thirds, with the same product and the same equipment and men. Only the intense application of brains to business will remedy the present situation of decreasing profits and rising costs."

The president of the Associated General Contractors of America, Mr. D. A. Garber, recently said in an address:

"A good friend of mine over in Brooklyn has been a contractor to my knowledge for thirty years, and he has been successful; I don't know how; but I suppose by the grace of God—that is what usually saves most contractors. I asked him how he kept his books. 'Well,' he said, 'that is simple enough. I do it the same way my father did. When I get a job I figure up how much money it is going to require to run that job. If I think $5,000 will do it, I take $5,000 and put it into a new bank. Brooklyn is pretty well supplied with banks. All the money I get from that job I put into that bank account. When the bills come due, I pay them out of that account, and when the job is complete, if I have more than $5,000 in that bank, I know I have made money. If I have less than $5,000, I know I have lost money.'

"You would be surprised," Mr. Garber goes on to say, "to know how many contractors have run their business that way in the past. But now we want to keep our own books. We want to make our own estimates. And we are assured, if a proper system of cost accounting is sent broadcast over the country among contractors, that it will be a universal help to them."

General Accounting: There has been so much agitation over the country about cost accounting that relatively small attention has been paid to the matter of accounting in general. Perhaps it is because of the lack of a suitable system of cost accounting that a business man's pocketbook is hit first, but cost accounting is just one link in the accounting chain; and it has been urged in some quarters that standardization should include the general field of accounting which might be worked out for any business, so that a balance can be struck, not only once a year, once in six months, or even once a month, but so that any day a business man can see a report showing where he stands that particular day.

Contracts: The Contract Record for Setember 17, 1919, says: "A national contract form, accepted and adhered to by all contractors and architects throughout Canada, is the hope of many in the construction industry." All schedules for building work in Scotland follow the plan laid down in the National Building Code of Scotland, which uses quantity surveying methods. All schedules of building work there must adhere to the same conditions and therefore contracts are standardized and on the same footing. It is most likely that the American construction industry would benefit through the standardization of contracts.

Commercial Arbitration: In this country we do not know very much about commercial arbitration; that is, a method by which business men may submit their commercial disputes to a committee appointed by a trade organization rather than by resorting to the courts. But in some of our largest cities it is being carried on with success. Some of our foreign neighbors have commercial arbitration developed to a point where it is in quite general use and accomplishes a most real and satisfactory purpose. Many construction people in America feel that it should be possible to introduce a standardized commercial arbitration plan whereby might be settled disputes arising between various units of the construction industry or between a unit of the construction industry and an outside interest. The congestion of the court dockets, the legal expense and disputes taken into the courts, the resultant delays, annoyances and bitterness are only too well known. It seems probable that by a standardized plan of commercial arbitration the construction industry would benefit through a general reduction in expenses, in delay and in friction, and in the creation of a happier and better feeling all around.

Export Trade: Construction interests in America have been so busy supplying domestic demands that until recently but small attention has been paid to foreign trade. The time has about arrived when America will be in a position to enter the foreign construction market to a considerable extent, and in preparation for that time standard methods for packing, shipping and handling materials for export might be developed to the general benefit of the industry.

Miscellaneous: Standardization would probably improve methods of submitting bids and the manufacturing and construction records.

4. Standards of Legislation: From certain quarters has come insistent pressure for standardizing municipal and state building and safety codes, and state inspection

legislation, such as that regarding boilers. It is recognized that building codes, for instance, must vary to some extent with regard to different climatic regions. However, uncalled for disparity in regulations in the different cities and states makes it almost impossible for the manufacturer of building equipment to comply with the various legal requirements placed upon him, and similar hardships are worked upon practically all other construction people in much the same way. Undoubtedly legislation in some cities and states in reference to a given subject is superior to that in other localities, and the effort at standardization along legislative lines should be unselfish and designed to enhance the welfare and safety of the public. Legislative standardization would also refer to bonds given by bidders, to other financial relationships, to fire protection and many other matters affecting the construction industry.

The realization of results from a program of legislative standardization would require sustained effort during a number of years. It is the opinion of a number of the leading thinkers in construction activities that the time is ripe for a strong concerted effort in this direction.

In conclusion, there are a few matters requiring general consideration.

American Construction Standards, insofar as they relate to materials, should invariably be understood as representing minimum requirements that must be complied with rather than the maximum over which no manufacturer may go in respect to quality. Manufacturers, need not be asked to deliver up their trade secrets, nor architects their individuality of design; but, if American Construction Standards are to assume real importance in the industry, a truly democratic, co-operative spirit must be manifest.

Contrary to current belief, European countries are not bled white, but are real industrial competitors. In France today there is considerably less labor trouble than in America, and the cry heard everywhere in the country is for industrial development. Albert Thomas, Citroén and other great leaders of capital and labor are pushing together toward this goal, for it means their salvation. Germany at this moment is paying more attention to the elimination of odd sizes, unnecessary designs, superfluous finishes, and to standardization in general than to any other one element in her industrial rehabilitation.

South America is rapidly becoming an important industrial competitor, as is most directly indicated by the daily shipments of American machinery to industrial plants on that continent. It is becoming daily more evident, if America is not only to hold her present position in the world of industry, but is to capitalize on the opportunity now offered her, that those of us who are concerned with design, engineering, manufacture and erection in the construction industry must place beside the other two great problems facing us today—finance and labor—the essential problem of standardization, which has a vital effect upon the other two.

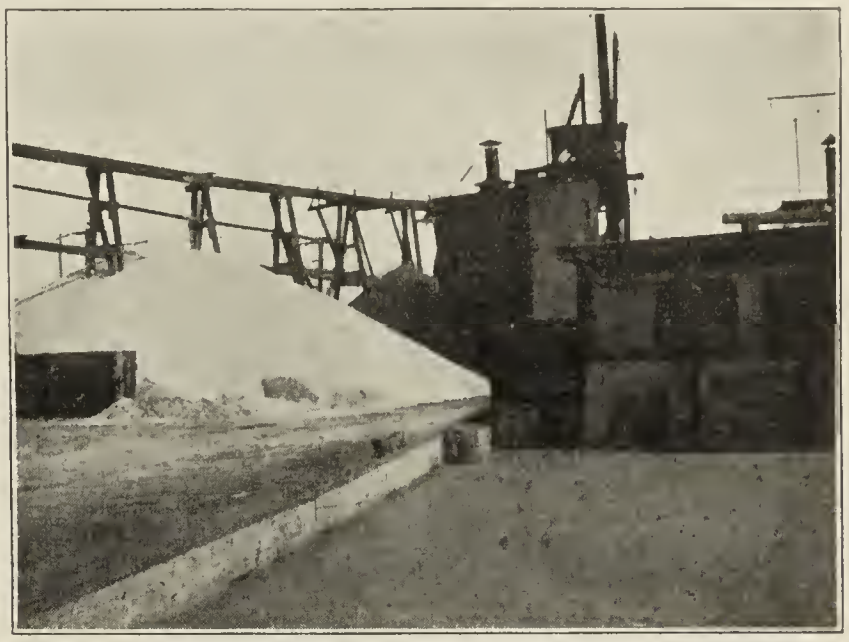
In the judgment of some, the time may not be ripe for such a program of increased and co-ordinated standardization as I have outlined. The directors of the National Federation of Construction Industries have arrived at no definite conclusions and will greatly value comment from individuals and interests concerned. We have come only to the point where we think perhaps it might be wise to launch a big co-operative standardization effort; and, if the others interested feel the time to be opportune, it is the hope of the Federation not to claim the glory of achievement, not even to operate the program, but simply to act as a clearing house, or one of the co-ordinating agents in the big enterprise.

The directors will accordingly appreciate expressions of opinion from those interested.

Electricity vs Steam

Sand Dealer Proves Substitution of Harnessed Current for Old Fashioned Power Saves Much Time and Cuts Down Expense—Eliminates Coal Cost and Makes Fireman Unnecessary

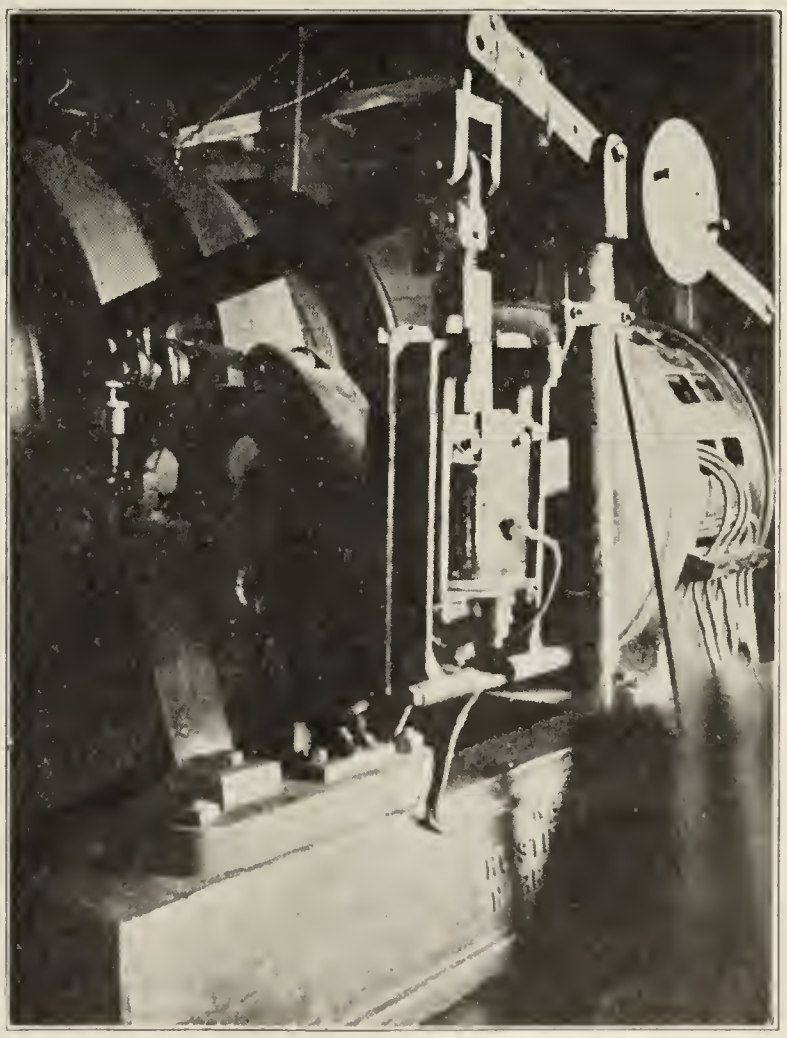
What electricity can do for a sand and gravel dealer is being vividly shown at Jersey City, N. J., where Washburn Bros. Co. have just installed it in place of



Overhead Trestle 350 ft. long upon which the conveyor operates from the hoist to the bins of Washburn Bros. Co.

steam as the motive power of their hoisting equipment used for unloading material from barges as they arrive at the docks.

The hoisting plant is located on the dock front at the end of the yard. The equipment has a two-story connecting building from which the engines operate. From the second floor the operator controls the hoist,



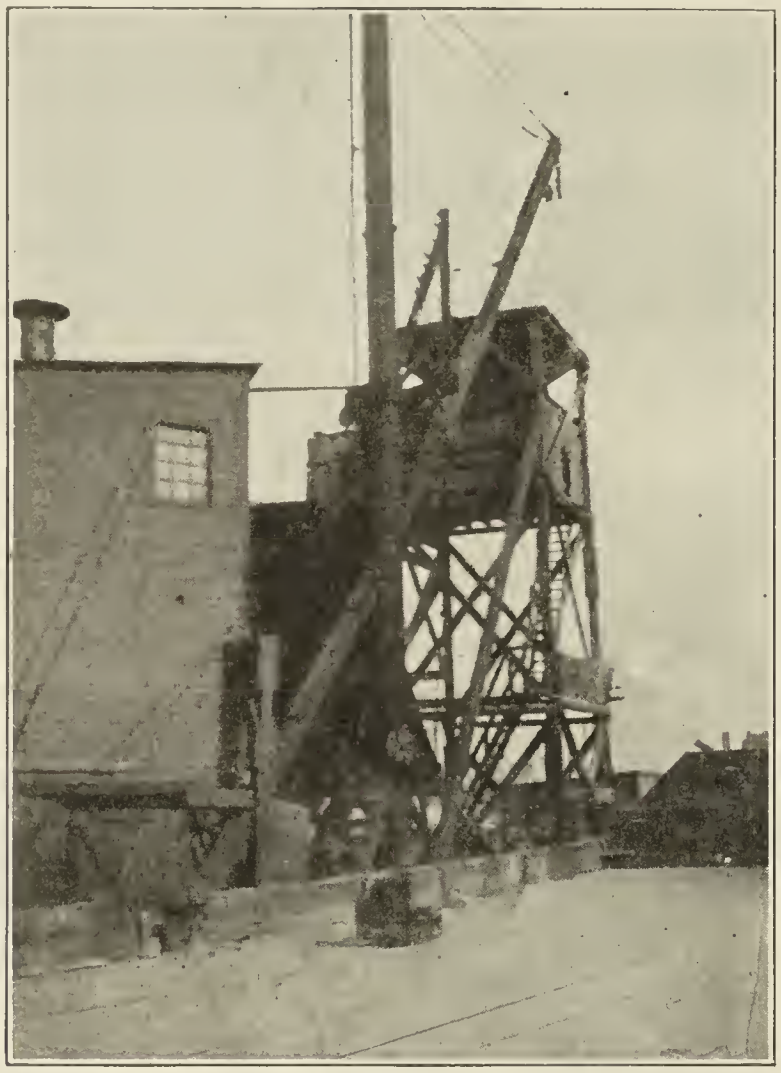
High-Power Motor Connected With Hoist Used by Washburn Bros. Co., Jersey City, N. J.

and this position permits him to oversee all the machinery very easily, at the same time giving him a clear view of the operations of the hoist. Being inside he is protected from the weather, thereby increasing his efficiency. He has a switchboard on one side provided with the necessary instruments, including ammeter and voltmeter, and load controllers, which work automatically in controlling the circuit with the load on or off.

The engine is direct-connected to a motor of 75 kilowatts, 220 volts, 2 phase, 60 cycle, and having a three-ton capacity, handling an average of fifty yards of material per hour. Electricity is purchased from the Public Service Co. at wholesale cost and enters the building at a safe and convenient point from the company's transformer at the other end of the yard.

Overhead Conveyor

The bucket hoists the materials into an overhead hopper which in turn by gravity flow empties into a



Here is the Electrically Equipped Hoists Used by Washburn Bros. Co. for unloading Barges of Building Materials.

dump car, which operates on an overhead trestle of wood. This trestle is 350 feet in length and is located directly over the bins for storing the various materials.

Advantages of Electrical Power

Mr. Washburn, in discussing the advantages of this new electric hoist, pointed out that while no exact figures are available the benefits derived are decidedly noticeable. With the low quality of coal now procurable and the necessity of keeping up steam all the time, it is impossible to maintain a fair degree of efficiency. Considerable loss of time occurs in getting up steam when the hoist is to be used, while electricity is positive and ready at a moment's notice, and the cost of operation is only for the actual time the hoist is used. By eliminating steam the labor cost is reduced as no fireman is necessary with electrical power.

Grit is Necessary to Achieve Success in the Concrete Products Business

By C. J. Davis, Timewell, Ill.

In the fall of 1909 I saw the great need for land drainage. Having owned and tiled several farms, I concluded to embark in the cement drain tile business. I bought an acre of land adjoining a railroad switch, erected a frame building 32 by 60 ft. and a low frame building for a workshop, afterward adding 60 by 90 ft. curing room 8 ft. high, all wood. I then equipped it with a Dunn tile machine, a block machine and a mixer, and had the tile cured by installing steam and spray system. Thought we were all fixed to do business then. Commenced to make the tile and thought if we had any waste we would make building blocks—this in the spring of 1910.

Had lots of inspectors of our goods; some pronounced the tile a failure, some thinking they would not answer the purpose at all. By this time we had our money all tied up and were in debt about $10,000, but had all confidence in our business. We would sell a few tile here and there and tried to spread them out as much as possible. It was now harvest time and the hand diggers all left us. Word had by this time gotten out that we had to go to the wall and our little bank was of the same opinion.

I had always heard that necessity was the mother of invention, and it appeared to me that if I could get the tile laid in the ground properly, that we would be all right. Looking over some magazines, I found a Buckeye traction ditcher advertised, wrote them about it, and went to see one in operation. In a minute I saw my way out of the trouble. The cost was $2,500 and no credit, so I went out through the country to find a man I thought was capable and honest enough to do the work. Going down the road I saw a field of corn in which the rows were all alike—straight and even. I inquired and was told it was the work of R. E. Arvin, who was running an engine to thresh grain for a neighbor. Hunted him up and found he was getting $2.50 per day. I put my proposition before him but did not have the collateral, so went to some of our men who were willing to try our tile and persuaded them to loan us the first payment on the machine, giving our tile in exchange. We bought the machine on the installment plan and went after the business to win, paid for the machine as per contract, all the time furnishing our tile for the work.

By this time the clay men had heard we were trying to get on our feet, so they put the price down on their product and we had to meet them or fail. We built up a good building block trade and went into the cement stave silo business. The tile that we first laid were giving the best of satisfaction and when people saw they were all right and the system was working so well, they began to take notice of our work.

Then came the war and we had to help win that before we could do business. We kept after our job and paid all our indebtedness off and even had some money in the bank. Now the war is over, we are out of debt and living on business street.

The spring of 1919 found us out of tile and blocks so we went to work putting up cement and sand bins and elevators to increase our production. The faster we increased our capacity, the faster orders came till today we have increased our output to double and the

orders still come. Have capacity for tiling 10 acres a day, 100 ft. apart and 3 ft. deep.

We invite all doubters to come and see us and investigate our business. To obtain best results, get an engineer on the job who will make an adequate estimate. To make good tile, lay them carefully, backfill properly, and success is yours.

Recent Developments in Concrete Testing Methods

The following notes on the work of the U. S. Bureau of Standards are taken from the recently issued report of the Director of the Bureau for the fiscal year ended June 30, 1919:

During the latter half of the year some progress has been made in systematizing and improving the methods of proportioning materials employed in the laboratory for fabrication of test pieces of mortar and concrete, which it is believed will aid in obtaining more accurate and uniform test results. A study has also been made of the effect of variations in the storage and curing of test pieces. A new method has been devised of measuring the "consistency" or "flowability" of concrete, these terms referring to the somewhat indefinite but very important property of concrete mixtures which is primarily dependent upon the amount of water used in mixing.

Methods of Proportioning.—Although in the field concrete materials are proportioned by volume, it is essential in the laboratory that weight per cubic foot be known to insure accuracy in duplicating tests and eliminating a variable, which may obscure the real differences in strength which should be obtained when comparing different aggregates or in repeating tests with the same aggregate. Often weights are reported as loose weights, determined by allowing the material to fall into the measuring vessel without jarring or tamping. In other cases weights may be reported as packed or tamped weights. The method now employed in the laboratory is to fill the vessel one-fourth of the height and shake and bump until no reduction in volume is apparent, repeating until the vessel is full. The top is then leveled with a straightedge and the net weight determined. The weight used in proportioning and in reporting the result of this test is 95 per cent of the packed weight so determined. Many tests have shown this 95 per cent packed weight to be approximately the average of the loose and packed weights. Since the weight of 94 lb. per cubic foot assumed for cement is approximately an average weight of cement loose and packed, the volume proportions used in laboratory tests are true volume proportions.

Storage and Curing of Test Pieces.—In connection with tests of concrete aggregates, observations have been made of the effect of storage and curing conditions on the compressive strenth of concrete up to 28 days. Test pieces molded from the same batches of concrete, in every way comparable, were stored in water, in damp sand, and in a damp closet. In general, it may be stated that under properly controlled conditions these methods are equally satisfactory.

The results obtained varied so slightly that for any one concrete the results of all test pieces could properly be averaged. Temperature conditions under all three methods were practically the same, so that with this sometimes variable factor eliminated it may be stated that any method of curing is efficient which permits all water to be retained in the specimen and permits no evaporation to take place. In a humid atmosphere, such as the damp closet, a sprinkling once daily apparently permitted no essential loss of moisture from the mass. This condition should be especially reassuring and satisfactory to drain tile and other cement product manufacturers, since it shows that closed rooms kept moist by occasional sprinkling during the curing period, furnish efficient means of storing these products. It should not be assumed from this that additional benefit will not be derived from a well planned and operated system of steam curing.

Flowability of Concrete.—Work which has been done in the laboratory in connection with tests of methods of proportioning concrete mixtures emphasizes most strongly the importance of being able to measure and express the important and fundamental quality of flowability of concrete. In actual work some minimum flowability must be attained, and laboratory concretes should be made with this requirement in mind, since on the job, if the concrete does not have sufficient flowability, more mixing water will be added. Such a property and condition is a necessity, but it is well known that increase in water lowers strength. Therefore, it is essential that aggregates tested in the laboratory should be tested in concretes having the same conditions of flow. Otherwise, misleading and incorrect conclusions will be drawn as to their relative values for concrete making.

In the last annual report a method for determining the consistency or flowability of concrete in the field was described. The apparatus consisted of a piece of cylindrical tubing 6 in. in diameter by 12 in. high, which was filled with freshly mixed concrete and then withdrawn vertically from the mass. The amount of settling of the unsupported concrete depended upon the amount of water used, and was, therefore, a measure of consistency. This test, commonly known as the "slump" test, was fairly well adapted to the rich mixture employed in ship and highway construction, but was found to be unsuited to the leaner and widely varying types of concrete which are encountered in the testing laboratory.

The flowability is now measured by molding a mass of concrete on a metal-covered table whose top can be raised a fixed height by means of a cam and dropped. The resulting bump will cause the concrete to spread in circular form, concentric with its original outline, the increase in diameter after a given number of repetitions of the bump being a measure of its flowability. Tests to determine the best form of test piece, as well as the height and number of drops, are still under way, but a number of interesting facts are already apparent. It is found that whatever the proportion of cement to aggregate, whether a 1—1—2 mix or a 1—3—6 mix, increase in flowability is proportional to increase in percentage of mixing water. Definite figures for flow can be obtained for concretes too dry for any ordinary practical purposes and also for concrete so wet that they would be ruled off of any properly inspected work. This variation in flow with increase in percentage of mixing water is essentially a straight-line relation within the limit of practical working mixes.

Some work has also been done with an apparatus of this type in determining the consistency of cement pastes, which is a fundamental step in the ordinary testing of Portland cement. While a comprehensive program of experiments has not yet been carried out, it may be stated that the method promises to be of higher merit than either the Vicat or ball methods now prescribed in the specifications.

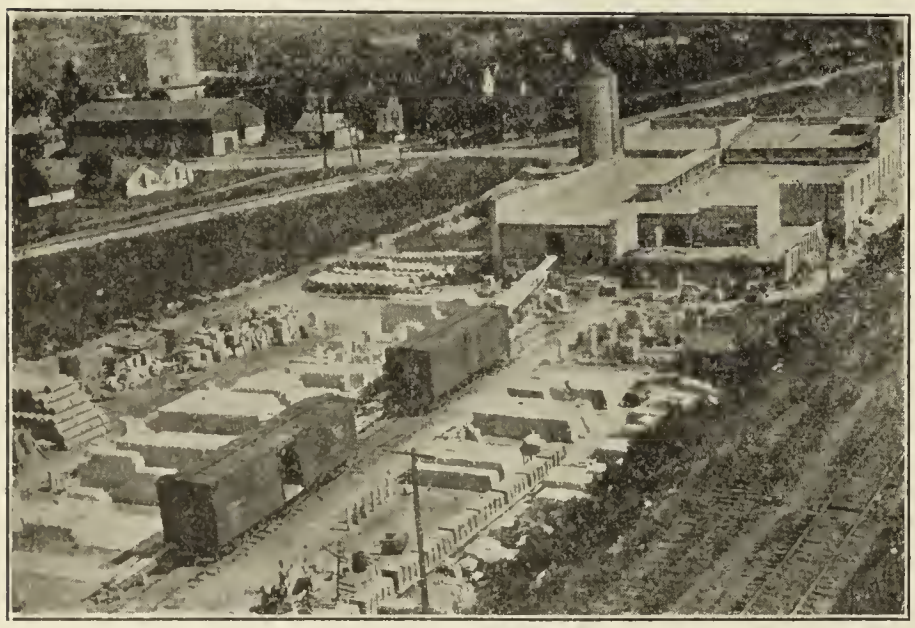
The Kind of a Cement Products Plant That Brings Returns

About four years ago, Mr. George Saffert, located in New Ulm, Minnesota, had organized what is now known as the Saffert-Gugisberg Company. He had long dreamed of a modern cement products plant and after three years he has developed and now operates one of the best-equipped and largest plants in the country, and the class of product that he turns out is one that he can well point to with pride.

The plant has grown from year to year until by the latest addition, it covers an area 173 feet by 125 feet, full two stories high throughout. The building is well-constructed of concrete blocks. This serves as an illustration of the appearance of the Company's products when used in construction. The front is of plain granite faced blocks made in Zagelmeyer molds. The rear and one side are made to show up the various building products as they appear in practical construction. On the opposite side granite rock faced blocks are laid up with red mortar joints.

To demonstrate the appearance and durability of cement stave silos, Mr. Saffert erected a ribbed stave silo in connection with his plant. It is 12 feet in diameter and 50 feet high, serving as a land mark in that section of the town. On one side is painted a warning sign: "Only satisfied customers are permitted to drive out of this yard." An unusual feature of the silos built by this company is that the doors are hinged.

The entire plant was built by the company's own force and during construction orders for its products were filled without delay. Below the street level a reinforced concrete bin for gravel 80 feet long is built to permit winter operations, the temperature being kept high enough to prevent freezing. Openings in the roof of this bin permit the gravel to be dumped direct from



Bird's-eye view of Saffert-Gugisberg Company Plant.

the wagon box without handling. From the bins, the gravel is elevated, screened and delivered to hoppers high enough to permit delivery of material to the measuring box and direct to the mixers by gravity.

The yard is systematically arranged and stock piles are marked with concrete posts bearing numbers. A diagram of the yard is kept in the office to facilitate handling and spotting cars and trucks without having to go out into the yard.

Each department is handled by a fixed crew of men. Forinstance, the tile crew do nothing but make tile on the Dunn tile machine and have their separate mixer, curing tunnels, etc.; the stave and block crews having their own equipment, etc. The pipe culverts are made in the open yard with Northwestern Steel & Iron Works forms. Miscellaneous work is handled in the general shop. This includes door and window forms, lintels, stills, copings, balusters, piers and ornamental work. All products in the making and when finished are conveyed through the shop to the

For demonstration Purposes a 50-foot Height Silo Has Been Erected on the Saffert-Gugisberg Property.

yard by means of trucks run on light T-rails and turntables.

The plant is operated to capacity every working day in the year, 63 men being on the payroll at the present time and 9 crews of three men each in the field erecting silos. In fact, the company has found it necessary to work night shifts for long periods to supply the demand for its products.

The present daily capacity of the plant is now about 400 24-inch by 8-inch blocks, 350 silo staves, 3000 feet of tile in various sizes, culvert pipe up to 48 inches in diameter, door and window frames, lintels, etc., to the capacity of the molds. Block capacity will be increased this fall to 800 per day and staves to 600 per day.

The blocks, staves culverts and other work except tile are made by the wet process and all are steam cured. For a radius of 50 miles these products are shipped to dealers.

The Saffert-Gugisberg Company have developed several new ideas, among them concrete door and window frames which are used in the construction of every barn they build. These have proved a success in every way.

These people are believers in live advertising Recently they had an engineer from a cement company come up and address a farmers' meeting on the subject of silos. One of the ways they show their products and at the same time gain the firm good will of their customers is to furnish with each bill for blocks, a lintel with the owner's name inscribed.

The Lime Industry

Preliminary Report on Production in 1919

About 2,976,000 short tons of lime of domestic production was sold in 1919 in the United States, including Porto Rico and Hawaii, according to an estimate made by Herbert Insley from returns furnished by the principal producers to the United State Geological Survey, Department of the Interior. The quantity reported is 7 per cent less than that produced in 1918 (3,206,016 short tons), which was 15 per cent less than that produced in 1917. The greatest production recorded for the United States was that of 1916—4,073,433 tons.

Of the forty States and territories producing lime in 1919, seventeen increased the output and nineteen decreased it as compared with 1918. The output of four remained about the same. The following table shows the estimated quantities of total lime and hydrated lime sold in all States that produced more than 20,000 tons of lime in 1919. The final figures for 1918 are also given, for comparison.

The sales of hydrated lime in 1919 amounted to about 740,400 short tons, an increase of 19 per cent over those in 1918—620,216 tons—and of 3 per cent over the previous record quantity of 1916. This recovery from decreases in 1917 and 1918 is in marked contrast to the continued decrease in the total sales of lime. The production of hydrated lime was reported by manufacturers in twenty-nine States. Three of these States—Arkansas, Nevada and Oklahoma—had never before reported production of hydrated lime, and two—Iowa and New Jersey—resumed production after a lapse of at least two years. Of the remaining States nineteen showed an increase in production in 1919 as compared with 1918, and five showed a decrease. Of the large producing States by far the greatest relative increase was reported from Maryland, which made an increase of 75 per cent over its output for 1918.

Lime Produced in the United States in 1919 and 1918

[Estimate for 1919; final figures for 1918.]

State.	Total lime. Quantity (short tons). 1918	Total lime. Quantity (short tons). 1919	Percentage of gain or loss in 1919.	Hydrated lime. Quantity (short tons). 1918	Hydrated lime. Quantity (short tons). 1919	Percentage of gain or loss in 1919.
Pennsylvania	675,100	801,834	—16	156,500	133,583	+17
Ohio	465,000	489,893	— 5	284,000	234,902	+21
Virginia	222,800	249,990	—11	(a)	(a)	+ 4
Missouri	184,700	201,737	— 8	36,000	34,942	+ 3
Michigan	141,700	134,813	+ 5	(a)	(a)	—36
West Virginia	135,000	167,901	—20	44,780	46,485	— 4
Massachusetts	133,780	123,697	+ 8	9,010	(a)	....
Wisconsin	128,200	109,303	17	24,680	16,883	+46
Tennessee	113,200	106,527	+ 6	21,650	19,268	+12
Indiana	108,000	116,321	— 7	32,130	24,574	+31
Maryland	103,250	106,737	— 3	44,130	25,218	+75
Maine	94,700	83,034	+14	(a)	(a)	....
New York	64,130	87,127	—26	(a)	(a)	+30
Illinois	62,530	64,672	— 3	(a)	(a)	— 7
Alabama	50,500	49,209	+ 3	6,500	6,327	+ 3
Texas	50,000	45,206	+11	18,940	15,594	+21
Connecticut	(a)	(a)	....	(a)	(a)	+34
California	38,500	55,588	—31	(a)	(a)	—30
Vermont	38,080	35,728	+ 7	(a)	(a)	....
Washington	21,950	22,118	— 1	(a)	(a)	—38
Undistributed	144,880	154,581	....	62,080	62,440	....
	2,976,000	3,206,016	— 7	740,400	620,216	+19

a Included in "Undistributed."

Building Lime

With very few exceptions, all the manufacturers of lime reported that 1919 was a much better year than 1918 for the sale of building lime. Practically all agreed that the demand was poor during the first half of the year—almost as poor as in 1918—but that demand increased very decidedly during the last half of the year. Two or three producers reported that the demand for building lime in the last half of the year of 1919 was greater than ever before. Although most contractors, as well as others, realized the serious shortage of houses, the confusion that followed the end of the war prevented the immediate revival of building, and no real effort was made to supply the demand for houses until about June, 1919. Barring financial difficulties, there seems to be no reason why the renewed activity of the building industries should not continue for at least five years or longer.

Chemical Lime

The peace-time chemical industries, like the building industries, took some months to recover from the confusion that followed the signing of the armistice, which ended all demand for lime for war industries. The demand for chemical lime in 1919 was fair to poor, but the producers in several States nevertheless reported an increased demand for chemical lime, especially in the last half of 1919.

Agricultural Lime

Producers reported that the average demand for agricultural lime in 1919 was about the same as the demand during 1918. The demand for burned lime for agricultural use has steadily declined during the last few years.

Other Lime

The reports of producers showed great differences as to the trade conditions for lime used in other than the chemical, building and agricultural industries. This difference was due largely to the fact that producers sold their lime to different industries, such as sugar factories, paper mills, glass works, smelter, steel works, and tanneries, their market depending on their geographic location and other facts.

The demand for lime used in metallurgy in 1919 apparently continued about the same as in 1918. One western company reported that the consumption of lime in smelters increased two and a half times; another company in the same district reported a marked decrease in the lime sold to smelters. A good demand, better than normal, was reported by most of those selling lime used in the glass, sugar, and paper industries. The production of refractory lime, which is principally dead-burned dolomite, declined greatly in 1919. Less than half as much dead-burned dolomite was produced in 1919 as in 1918. As dead-burned dolomite is used principally in lining basic open-hearth furnaces the decline in its output, though not definitely explained by the producers, is attributable chiefly to the cessation of the demand for steel for military use and to the steel and coal strikes in the last few months of 1919—causes that decreased the production of steel in 1919 about 27 per cent and that reduced correspondingly the demand for dead-burned dolomite. The expectation of a renewal of imports of magnesite from Austria also influenced the producers of dead-burned dolomite to reduce their output. In 1918 the production of dead-burned dolomite increased much faster than the production of iron and steel, so that at the end of the year the manufacturers of steel had on hand an oversupply of dead-burned dolomite. The sales of dead-burned dolomite in 1919 were much greater, however, than the sales in either 1914 or 1915.

Conditions in Commercial Districts

The following table shows the estimated quantities of lime produced in the fourteen commercial districts outlined in 1919 by the Lime Association, as well as the production of those districts in 1918.

Rubber Goods for

Granite Suction Hose

Cotton Rubber Lined Fire Hose

U. S. Conveyor Belt

THE cement trade salesmen and the practical factory men of the United States Rubber Company are qualified through study and experience to recommend the right mechanical rubber goods for any condition existing in this industry.

They are ready to assist cement mill operators by advising as to the best application of mechanical rubber goods in order that the greatest possible service may be obtained for every dollar invested.

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

BELTING

Transmission *"Rainbow," "Pilot" "Shawmut"–"Giant Stitched"*
Conveyor *"United States," "Grainster"*
Elevator *"Matchless" "Granite," "Grainster"*
Tractor *"Sawyer Canvas" "Little Giant Canvas"*
Agricultural *"Rainbow," "Bengal" "Grainster," "Sawyer Canvas"*

HOSE

Air *"4810," "Dexter"*
Water *"Rainbow," "Mogul," "Perfected"*
Steam *"Rainbow," "Giant," "Perfected"*
Suction *"Amazon," "Giant"*
Garden *"Rainbow," "Mogul," "Lakeside"*

Also Hose for Acetylene, Oxygen, Acid, Air Brake, Gasoline, Oil, Hydraulic, Air Drill, Auto Radiator, Car Heating, Chemical, Coke, Creamery, Discharge, Vacuum, Sand Blast, Spray, etc.

UNITED STATES RUBBER COMPANY
US
RUBBER SYSTEM
AND ASSOCIATED COMPANIES

The Cement Industry

BEING in close touch with the trade and with each other, our salesmen and factory men are able to combine their experience for the benefit of our customers, large or small.

Take advantage of this Company's facilities and experience when in the market for rubber goods. Through our nearest Branch you can obtain the fullest co-operation of our organization.

U. S. Elevator Belt

Rainbow Steam Hose

Rainbow Belt

United States Rubber Company

The World's Largest and Most Experienced Manufacturer of Mechanical Rubber Goods

PACKINGS	MISCELIANEOUS
Rod *"Wizard," "Rainbesto," "Peerless," "Honest John", "No. 573" and hundreds of other styles in coils, rings, gaskets and diaphragms* —	Mats, Matting and Flooring, Dredging Sleeves,
Sheet *"Rainbow," "Vanda," "Paramo"* **Usco Valves** —	Plumbers' Specialties, Hard Rubber Goods,
	Rubber Covered Rolls, Printers' Blankets, Tubing,
	Moulded Goods Soles, Heels, Jar Rubbers,
THE RIGHT PACKING IN THE RIGHT PLACE	Friction Tape, Splicing Comp'd.

UNITED STATES RUBBER COMPANY US RUBBER SYSTEM AND ASSOCIATED COMPANIES

Lime produced in the United States in 1919 and in 1918, by districts

[Estimates for 1919; final figures for 1918.]

District.	Producing States or parts of States.	Quicklime (short tons).	Hydrated (short tons).	Total for 1919.	Total for 1918.	Increase or decrease in 1919. Hydrated lime	Increase or decrease in 1919. Total Lime
1	Maine, Vermont, Massachusetts, Connecticut, Rhode Island, eastern New York	341,450	29,510	370,960	380,311	— 2	+11
2	Eastern Pennsylvania, New Jersey, Maryland, eastern West Virginia	465,000	226,730	691,730	871,890	—21	+23
3	Western Pennsylvania, western New York, western West Virginia	206,790	27,280	234,070	211,332	+11	+29
4	Virginia, North Carolina[a]	222,800	(b)	222,800	249,990	—11	+
5	Ohio	181,000	284,000	465,000	489,893	— 5	+21
6	Michigan	141,660	(b)	141,700	134,813	+ 5	—
7	Illinois, Indiana, eastern Missouri	235,400	67,370	302,770	322,596	— 6	+21
8	Wisconsin	103,520	24,680	128,200	109,303	+17	+46
9	South Dakota, Minnesota, Iowa	22,750	(b)	22,750	(c)	—	—
10	Kentucky, Tennessee	93,390	21,650	115,040	108,411	+ 6	+12
11	Alabama, Florida[d]	44,000	6,500	50,500	49,209	+ 3	—
12	Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas, Louisiana, Wyoming, Colorado	64,920	8,490	73,400	77,838	— 6	—
13	Texas, New Mexico	35,160	18,940	54,000	47,496	+14	+21
14	Western Montana, Idaho, Utah, Arizona, Nevada, Washington, Oregon, California	73,100	8,190	81,290	111,729	—27	—24
	Undistributed[e]	18,670	3,120	21,790	41,205	....	....
		2,235,670	740,400	2,976,000	3,206,016	— 7	+19

a Virginia only; North Carolina included in "Undistributed."
b Included in quicklime.
c Included in "Undistributed."
d Alabama only; Florida included in "Undistributed."
e Includes Hawaii, Porto Rico, North Carolina and Florida.

Economic Conditions

The decrease in the demand for lime was not the only or even the principal fact that controlled the production of lime in 1919. The high cost of raw materials and tools, the scarcity and poor quality of labor and the high wages forced up the selling price, and a shortage of shipping facilities greatly reduced the output of some manufacturers. Practically all manufacturers reported a higher selling price in 1919 than in 1918, and many complained of the shortage of labor and of its poor quality. The shortage of cars that prevailed throughout the war continued in 1919. In the spring and early in the fall producers were seldom able to get as much as half the number of cars they required. As a rule, the actual number of cars supplied ranged from 3 to 40 per cent of the producer's normal needs. Even in the dull season, it was difficult to get the cars needed. Under favorable conditions the producers could supply a demand much greater than that made in 1919.

Six districts—the third, sixth, eighth, tenth, eleventh, and thirteenth—showed increases in the production of all lime in 1919 as compared with 1918. The greatest increase—17 per cent—was made in the eighth district. The greatest increase in the quantity of hydrated lime produced—46 per cent—also was made in the eighth district. Eight other districts also showed increases in quantity of hydrated lime produced.

Nearly all the companies in district No. 1 reported higher prices in 1919 than in 1918. In all the States in this district the demand for building lime was much better than in 1918. In general the demand for chemical lime was less in 1919 than in 1918 except in Vermont, where it seemed to be as good if not better. The demand for agricultural lime remained about the same. The demand for lime for other uses was better in Vermont, Massachusetts, and New York. No reports on lime of this class were received from the other States in the district. This increase in demand in 1919 may have been due in large part to the increased use of lime in paper mills, as a large percentage of the lime produced in New England is usually sold to paper mills. The single producer of dead-burned dolomite in New York State reported a normal demand for this product.

In district No. 2 the trade conditions appeared to be better than in 1918. About one-fourth of the output is used in agriculture. Most of the producers reported that the demand for agricultural lime was the same as in 1918 or better. A smaller percentage of the production of this district (from 10 to 15 per cent) is used as building lime. The demand for lime of this class was generally much better than in 1918. The demand for chemical lime was not so good as in 1918, but the demand for lime for other purposes was about the same.

In district No. 3 prices seemed to be generally a little higher athough several producers reported lower prices. The trade conditions in this district were about the same as in district No. 2. The demand for building lime was better, for chemical lime about the same or a little less, for agricultural lime about the same, and for lime for other purposes a little better.

The only producing States in district No. 4 are Virginia and North Carolina, and as North Carolina has less than three producers and the publication of its figures would reveal the production of individual companies the production of Virginia alone has been used to represent that of the district. About half the producers in this district reported higher prices in 1919, three reported lower prices, and the rest reported that prices were about the same. In other years more than half the lime produced in this district has been sold for chemical uses. The demand for lime of this class has apparently decreased somewhat, and it is perhaps this decrease that has reduced the total production of the district. The demand for building and agricultural lime was good and that for lime for other uses was normal. The shortage of coal in December forced several producers to shut down their plants altogether for that month.

In district No. 5, which includes only the State of Ohio, most of the producers raised their prices in 1919 and the average price was higher than in 1918. Only two producers reported lower prices. About half the lime produced in Ohio is normally used for building. All manufacturers reported a great demand for building lime, estimates of the increase ranging from 10 per cent up to "the best demand for hydrated lime in the history of the industry." The demand in some places was light during the first half of the year but invariably increased greatly in the last half. Scarcity of labor and shortage of cars often prevented producers from filling orders. The demand for chemical lime remained in general about the same as in 1918, although one producer reported a decrease of 25 per cent. The demand for agricultural lime was about the same as in 1918 or a little better. There was a slightly better demand for lime for other uses.

In the sixth district, which includes only the State of Michigan, the reports of the producers indicate that the price remained about the same. About 80 per cent of the lime produced in this district was sold for chemical uses during the war. The fact that there was a slight increase in the quantity sold in 1919 as compared with 1918 indicates that the manufacturers were able to supply an increased demand for building lime and for chemical lime for peace-time industries. Only a small quantity of lime was sold for agricultural or other uses, and therefore no marked change in the sales of lime of these classes was apparent.

In district No. 7 in general higher prices prevailed, although one company in Indiana reported lower prices. The output of this district is fairly well divided among several industries. In 1918 about 20 per cent was sold for building lime and the percentage for 1919 was probably much higher. In this district, as in others, the demand for building lime was stronger in 1919 than in 1918, although one or two companies reported a decreased demand. During the war about 25 per cent of the output of this district was sold for chemical uses, but in 1919 most of the producers reported a decreased demand for chemical lime. Only a small quantity is sold for agricultural use, so that no notable changes were recorded in the sales of lime of this class. Most of the lime sold in this district is used for other purpoes than those mentioned. A large quantity is sold for use in metallurgy paper making, the purification of water, and the manufacture of soap. Producers reported unchanged trade conditions for lime sold for these uses.

In district No. 8 about 83 per cent of the output in 1918 was building lime. All producers reported higher prices and correspondingly increased costs of production. Practically all producers reported a much greater demand for building lime, although a strike in the building trades caused a slack period of short duration. The demand for chemical lime remained about the same. Very little of the lime shipped from this district is sold for use in agriculture. Most of the lime used for other purposes than those mentioned is sold to paper mills. Producers in general reported a better demand for lime of this class and one reported an increase of 25 per cent in the sale of hydrated lime to paper mills.

In district No. 9 prices advanced slightly in 1919. Most of the product in this district is building lime, but a small quantity is sold for chemical uses. Very little lime is sold for any other purpose. During the first half of the year the demand for lime was very poor, but during the last half it gradually increased as building operations began.

In district No. 10 nearly all the producers reported increases in prices. In other years at least one-third of the lime produced there has been sold for use in buildings and the demand for building lime was much greater in 1919. The demand for chemical lime was not so great as in 1918, probably because many plants that manufactured war materials were compelled to close. The demand for lime for paper mills seemed to be good, and one producer reported a much better demand for lime for sugar factories.

In district No. 11 prices were higher. More than half the product in this district is building lime. In 1919 the demand for lime of this class was better than usual. As Florida has less than three producers, its production is not included in that part of the district. One producer in Florida reported that the demand for both building lime and agricultural lime was far greater than the supply.

In district No. 12, as in other districts, the average prices were higher, although several producers maintained the same scale of prices as in 1918. More of the lime produced in this district is sold for building than for any other use, although large quantities are sold for chemical, metallurgical, and other uses. Relatively little lime is sold to paper mills, sugar factories, or for agricultural use. The sales of building lime increased, especially during the last half of the year. One producer reported that the demand for building lime was very dull during the first six months but that during the last six months it was the greatest in the history of the lime industry. There was a marked decline in the sales of chemical lime, due to the closing of the war industries. The demand for lime for agricultural and for other uses remained about the same.

In district No. 13, which includes Texas and New Mexico, the average price was higher. In this district the demand for building lime, which constitutes at least 65 per cent of the output of this district, was generally greater than in 1918. One producer reported a decreased demand for lime for all uses. Lime for chemical uses makes up only a small percentage of the output of this district, but most of the producers reported an increased demand for it. The sales of lime for agricultural and other uses remained about the same.

District No. 14, which includes all the territory west of the Rocky Mountains, showed a greater decrease in production than any other district, both in total lime and in hydrated lime. Oregon increased greatly its small production, and Arizona showed an increase of about 1 per cent, but the other States in the district decreased their production. Nearly all the producers increased their prices, yet one producer in the State of Washington reported that prices were too low to give a fair profit because of the importation of lime from British Columbia. In this district in general, the demand for building lime increased and that for chemical lime remained about the same. The demand for agricultural lime seemed to be slightly better than in 1918, when it was poor. A large percentage of the lime sold in this district is used by smelters and by sugar factories. One company reported a marked decrease in the smelter trade, but another reported that consumption by smelters increased two and a half times. A producer in Washington reported a very good demand for lime by paper mills.

Concrete Gas Tank

Concrete that will be impervious to gas, the first example of this ultra-modern construction development, will be laid tomorrow for the first time in Davenport and the first time in Iowa at the People's Light company gas plant at the foot of Myrtle street, says the Davenport, Iowa, Tribune.

The company is building a gas purification tank. This tank will have walls through which the faintest gas fume, even under high pressure, can not penetrate, through which water can not seep, through which even oil can not penetrate.

In addition to special mixture the tank will be coated with a patent waterproofing material. The job must be completed at one pouring in order that there may be no cracks in the walls. The work of pouring will be begun early in the morning and if not completed by nightfall will be continued by artificial light.

The tank will be 20 feet square and 12 feet deep. It will be filled with oxide through which the gas will be forced separating the sulphur, the principal impurity. The cost will be approximately $7,500. J. F. Nebergall & Son are contractors.

Chief engineers were led to substitution of concrete for steel due to the prohibitive cost of metal. The outside tank type of construction also eliminates the necessity of a building which was formerly constructed to house the purifying tanks. This new method of construction, says General Manager C. N. Chubb of the Peoples Light company, will save the concern a large amount of money, which would have been necessary had the old type of interior construction been duplicated.

News of the Cement Mills

At the annual meeting of the shareholders of the International Portland Cement Co., Spokane, Wash., Mr. J. S. Irwin was, for the tenth consecutive year, unanimously re-elected president of the company. The present financial position and future busines prospects of our company were never better, says Mr. Irwin. Our output for the year is practically all sold, and it is no longer a question of how much cement we can sell, but it is a question of how much cement we can produce and how many cars we can secure for shipments.

"It must be remembered that during the war period, building operation, shipping facilities, etc., were restricted by the National Government, thus limiting our volume of busines, but now the reverse is the case and building operations of all kinds are encouraged, besides large sums of money are being appropriated by the National and State Governments for irrigation projects and paved highways. Building activity is general in the Western States and for these reasons the tonnage capacity of our quarry is being increased so as to enable us to operate our plant at maximum capacity.

On the subject of road building, Mr. Irwin said: "As has been the case with cement buildings and bridge construction, concrete for road building has gradually proven its own worth, until today nearly 90 per cent of all bids called for provide for Portland cement concrete. The test of time has brought this about. A concrete highway rightly built according to modern specifications, is without the slightest doubt the most serviceable and economical that it is possible to build. It is practically the only structural material that will successfully withstand the increased traffic and heavy motor truck tonnage of the present day. This traffic is in its infancy. It will increase from year to year and the road builders of the present must look to permanency. They must provide for this increasing heavy traffic or rebuild the roads later on, at enormous cost.

The Industial League, H. J. Arrington, president, Claremont, Va., has a cement plant location deposits of tertiary soft limestone on rail and deep water transportation, less than 1% magnesia oxide, 80 to 95% lime carbonate, average 85%. Plenty of clay accessbile. Convenient to trunk live coal carrying railroads. Center of territory requiring large quantities of cement for hauling and highway construction work.

E. Antonio Vazquez, 44 Whitehall St., New York, N. Y., wants to engage the services of a mechanical engineer for a cement plant in Cuba.

The Sandusky Cement Company is spending $100,000 to build some residences and rooming houses for the employes of its plant at Dixon, Ill. The company realizes that prices are high, but the management says that busines judgment declares in favor of building now. No cheaper prices are in view and conditions may be much worse rather than better. Material is likely to be more expensive and the scarcity of homes will probably be intensified.

H. W. Schoefield, St. John, N. B. Canada has for sale a large deposit of high grade rock suitable for the manufacture of Portland Cement. This property is situated on deep water with splendid shipping facilities to South America, and would be sold at a very reasonable rice.

The Southwestern Portland Cement Company operate a Bucyrus 68-C steam shovel in their quarry at Victorville, Calif., which is giving absolutely no trouble and is doing splendid work.

Ben L. Schultz, president Crystaline Lime Company, Lewiston, Idaho, writes: "Under separate cover I am mailing you copy of the Lewiston, Idaho Morning Tribune, containing an article concerning a cement deposit we have near our city. It might be well to let some of the larger operators know about this deposit. Interested parties are advised to write us."

"There's nothing to arbitrate."

With these words Manager B. Condon of the Hawkeye Cement Co., Des Moines, Ia., ignored Governor W. L. Harding's order calling on the company and union to name arbiters for a settlement of their wage controversy.

The union has named its five representatives, but Condon declares the plant is working with a full crew of 150 men and no dispute exists between the concern and its present employes.

Two months ago the workers walked out when Condon refused to grant their wage demands, but others have filled their places, he says.

International Portland Cement Co. plant at Irvin, Wash., will be improved to the extent of $100,000. New machinery, in several units, is being installed in the company's quarry and during the year new holdings will be opened up to push production. The International Portland Cement Co. is the owner of 1,200 acres of quarrying land which provide a supply for 100 years. At the present time a force of 100 men are employed at the quarry. The addition of the new machinery, while not calling for an extensive increase in the number of workers, will greatly further the amount of production.

The Kosmos Portland Cement Company, whose plant is located at Kosmosdale, near Louisville, owing to the large increase in their business has found it necessary to increase their capitalidation from $1,000,000,000 to $1,500,000,000, amended articles of incorporation to that effect having been filed. Their stock issue will consist of 15,000 shares whose par value will be $100. Samuel Horner, Jr., and Charles Horner signed the amendment.

The Santa Cruz Portland Cement Co., Davenport, Calif., at its annual meeting increased its dividend rate from 5 to 6 per cent. W. W. Crosker was chosen director vice W. R. Berry, but otherwise there was no change in the directors.

The Security Cement & Lime Co., Equitable Building, Baltimore, Md., has acquired property aggregating about 97 acres of land at its works at Security, near Hagerstown, Md., and will add the tract to its present factory site.

Art in Concrete Tile Roofing

In building the home much thought is given to the interior arrangement, to closet space and to the selection and treatment of interior trim, and far too little to the important question of roof covering. In these days of the high prices of labor and cost of repairing a decaying roof by no means is light and this does not take into account the annoyance and inconvenience of making the repairs.

An All Concrete Bungalow Constructed at Indianapolis. Walls are Concrete Blocks, Stuccoed. Roof is of Cement Shingles.

That a roof should be decorative as well as possess utilitarian advantages is now conceded by architects and builders. For several years this has been the case and is becoming more and more so as the advantages of concrete tile become manifest. Another feature of the concrete tile is its fireproof qualities which bring a slightly lower insurance premium and is an absolute guarantee against fire catching from sparks.

In European countries tile has proved its usefulness for many years and more tile is used for roofing material because of its beauty, permanence and its fireproof qualities. Heretofore, one drawback to the use of tile has been the greater first cost. With the introduction of concrete tile, however, much of the objection to cost has been overcome and, in the long run, the concrete tile roof figures out a real saving in that once in place it can be left without repairs, renewals or thought, and the color of the tile will not deteriorate nor will the tile decay in any way.

Concrete roofing tile have been used on dwellings, garages and out-buildings. Tile are now made in four colors—red, green, brown and gray—and a little thought to the color scheme will work out some attractive arrangement of the colors. The color in the tile, it should be noted, is tamped in them while they are green and so becomes an integral part of the tile. The surface of the tile is smooth, non-porous and they will remain perfectly clean when in service.

Much thought and care is given to the method of applying the tile. A 12-lb. felt paper is laid over the roof boards, A ⅜-in. strip is then nailed across the roof, spaced 12 inches apart and on these the tile are hung. The tile are so constructed that they interlock. This method of laying provides an air space and permits of the give and take, permitting the tile to expand in warm weather or to contract in cold weather. This is an especially important feature of the Ohio tile roofs, since there is no breakage of the tile through expansion or contraction.

This space makes the rooms directly below cooler in warm weather and warmer in cool weather, the non-conducting air space acting like a blanket to keep a more even temperature in the rooms in the top story of the building. Standard size of the tile is $9\frac{3}{16}$ by $14\frac{3}{4}$ by ⅜ inches, and they weigh approximately 5½ lbs. each. The tile are laid with an exposure of about 8 by 12 inches, 150 pieces being required to lay a square.

Special tile are made for all types and shapes of roofs so that any roof may be covered with tile. These shapes include ridge rolls, hips, end tiles, hip starters, finials and similar shapes.

A tile roof is absolutely storm-proof, water-proof and fire-proof. On account of their permanency and their attractive colors they enhance the value of the buildings upon which they are used.

The Ohio Tile Machinery Co., Willoughby, Ohio, has issued a neat, attractive folder in colors, descriptive of its machinery and process of making concrete roofing tile, which inspired the foregoing.

Belt Conveyor Assists Excavation

A portable belt conveyor to remove excavated material and load it into wagons was used by the Lincoln Gas & Electric Co. in the excavation for three 110,000-gal. oil storage reservoirs at Lincoln, Neb. The belt travels on a steel truss boom pivoted to a wagon bed which carries a gasoline engine, the ends of the boom being guyed from a gallows frame seated on the wagon bed. With the machine placed on top of the bank the boom is inclined with one end in the pit, where men shovel the material onto the belt, while the other end is high enough for wagons to drive under it to receive th material. The machine was shifted around the pit as excavation progressed.

Efficiency of Rotary Cement Kilns

By W. E. Snyder, Chemist, Expert on the Manufacture of Portland and White Cements

Again the wheel of agitation is brought to its former momentum on the subject of efficiency of rotary cement kilns.

This very important and interesting subject somehow pops up periodically, some fifteen years ago this subject was brought to the attention of the manufacturers by various scientific investigators, but after a lengthy magazine debate pro and con, this subject appears to have been forced into a deep and silent slumber, so now this subject apparently has been annoyed and brought back to a degree of activity, which no doubt is caused by the effects of the recent world war.

The articles along the lines of this subject which appeared in recent publications by Robert W. Lesley, Rapier R. Coghlan and S. B. Newberry, are in general most interesting and should be sufficient to convince the manufacturers of the vital necessity and future possibilities for further improvements in the present rotary kiln process. It is the writers private opinion, that if some one would volunteer to try out these splendid suggestions, it would soon be learned what extraordinary results can be accomplished in a practical way, which, however, is so often misconstrued when only the theoretical side of the subject is discussed and thus causing a detention of progress.

First of all let us take into consideration the preparation of the coal as a fuel which is the initial procedure and where the starting point of the investigation and changes should take place. There has been a lavish waste of coal in rotary kilns in the past, due largely to coarse grinding. In order to obtain the full value of a coal as a rotary kiln fuel, we must disregard or eliminate all 100 mesh material and be guided by the 200 and even the 300 mesh sieves, which as per the experiments carried out by the writer some fourteen years ago, trying out coal as a fuel for burning white cement and overcome discoloration by the contamination of fuel ashes with cement clinker, it was learned that for every 1% of 100 mesh, one pound of fuel was wasted per barrel of clinker burned. This not only applies to white cement, but the gray or standard portland cement as well. This coal or fuel was ground in a tube mill and afterward separated by air, thus eliminating all 100 mesh material, which gave by sieve test 93% passing a Number 200 mesh sieve and 83% passing a Number 300 mesh sieve. This operation, however, was too expensive, so it was decided to use oil as a fuel instead, as it was considerable cheaper. This extreme fine grinding in those days was entirely impracticable, but with the constant improvement achieved in grinding machines, it is at this time a practical proposition. By this extreme fine grinding from five to ten pounds of coal per barrel can be saved to start out with. To mention any fixed figures in dollars and cents the saving this small item will amount to, perhaps would be misleading due to the uncertainty of coal prices. It is a very simple problem and anyone familiar with the prevailing prices of coal can quickly ascertain the saving thus in store.

Let us now go one step further and take into consideration the index or working condition of the kiln, its construction together with the revision of the process necessary to accomplish improved efficiency. There has been so much agitation on the subject of excess air entering the rotary cement kiln over that theoretically required for complete combustion, that the writer is inclined to believe that something should be said along these lines in order to make it a little more comprehensive and further that perhaps there is much less space for economy on this subject as has heretofore been expected. In a publication some time past, an attempt was made to show the large percentage of air passing through the kiln in excess to that theoretically required for combustion, an analysis of the kiln gases was given, in which the free oxygen (0) amounted to very near 12% while the carbon monoxide (CO) was given at one-half of one per cent. The high percentage of free oxygen however, indicates a very large percentage of air in excess, providing the sample of gas was taken direct from the mouth or intake of the kiln. If this sample was taken from the stack, it is quite evident that the gases had been considerably diluted by the air which creeps in through the flue doors and the opening between the flue and revolving kiln. It appears impossible to accurately determine the index or working condition of a rotary kiln by taking the gas samples from the stack and afterward approximating the amount of dilution which is apt to yield results of more or less uncertainty. The writer has not yet found two kilns that yield a gas when drawn from the stack of exactly the same dilution and therefore considers the proper place to sample the gas for determining the index of a kiln, to be direct from the mouth or intake, where there is no possible chance for contamination.

In order to show the dilution which takes place in the flue between the kiln and the stack, the writer has sampled and analyzed the gas from a rotary cement kiln using powdered coal as a fuel which yielded the following:

Sample No. 1.

CO_2	12.40%
O	10.00%
CO	0.00%
N etc. by difference	77.60%

The high percentage of free oxygen in analysis No. 1 certainly confirms the past publication very closely, but this however does not convince anyone that such was the index of the kiln, after knowing that the gas was drawn from the stack where it becomes diluted with air which creeps in through the openings in the flue. After all openings in the flue were closed as tight as possible, with the exception of that space necessary between the kiln and the flue, the second sample was drawn from the stack which yielded the following:

Sample No. 2.

CO_2	14.20%
O	9.40%
CO	0.05%
N etc. by difference	76.35%

The decrease in the percentage of free oxygen in analysis No. 2 brought about strong evidence to the fact that the index of the kiln was considerably better than that indicated by the previous analysis.

In order to show the exact index of the kiln, a sample was drawn direct from the mouth or intake which yielded a gas of the following composition:

Sample No. 3.

CO2	29.30%
O	0.70%
CO	0.40%
N etc. by difference	69.60%

This should be sufficient proof to show that there is a very slim chance for improvement on the excess air subject if the burner in charge will at all times apply the proper precautions.

At this very point it becomes vital that the operat-

ing superintendent and chemist co-operate in order to arrive at the maximum output of the kilns with the minimum consumption of fuel. It is an established fact that the kiln is the heart of a cement plant and if this department is neglected, no other department will make up for it. How many mill superintendents and chemists in the cement field today are capable to take complete charge of a kiln building in a practical way? In any event the best results will never be obtained until the operating superintendent and chemist in charge of every cement plant will make a special effort to learn the practical end of rotary kilns and their local conditions, of which only a thorough knowledge can be obtained through the practical experience of kiln burning. This may however appear to be rather a laborious task, but this is a vital necessity and should be put in universal practice for the benefit of the investor and improvement in efficiency in general.

A rotary kiln is very simple in its construction, in fact nothing but a cylindrical shell of heavy sheet iron of various diameters and length, lined with firebrick and placed on a slight incline position for the purpose of conveying the raw mix or composition from the mouth or intake, to the discharge end of the kiln as it revolves. At this point the combustible or fuel such as gas, oil or powdered coal is blown in through an opening in the hood continuously to keep up the temperature necessary to convert the raw material to complete incineration.

The temperature required as per pyrometric measurement ranges from 2600 to 2900 degrees F. at the point where the clinker is formed, but at the combustion zone the temperature is still higher. This process of burning as can be seen depends entirely on the radiation of the deflagrated zone together with the reverbaratory action of the upper half of the kiln shell. The different temperatures required to form a clinker of perfect vitrification depends upon the preparation of the cement mixture.

The capacity of kiln production is very often hampered with unconsciously, when the capacity of the raw grinding department falls below that of the actual kiln capacity, in which case it is a very common occurrence to force the raw grinding beyond its normal capacity and thus feeding the kiln with coarse material which causes a decreased kiln production and an increased fuel consumption. This effect is also experienced when a kiln is fed with a so-called overlimed mixture, oftentimes through some neglect or other, both these undesirable foes take place at one and the same time, in this event the kiln is looked upon to make good the negligence of prior steps for which the kiln is not responsible, the manufacturer is at this point facing two unpleasant burdens, only one of which will he be able to overcome while the other will be a costly sacrifice. It is, however, ill practice to overburden kilns in this manner, but very often the case, unconsciously, however, due to the lack of practical experience in kiln burning. If we take into consideration the immense cavity in a rotary kiln that must continuously be kept at a degree of incineration and the loss of heat by radiation, kiln gases and the heat necessary to preheat air whether excess or normal, with a combustible that is in practical use today, we can plainly see that the kiln has burdens of its own and should not be expected to carry that of any other department.

We must admit, however, that the rotary kiln process as it is operated today, is indeed crude and wasteful. The question may now arise as to what are we going to do? We have these kilns installed and we must therefore continue to operate them until someone can or will tell us what improvements can be applied or what other type kiln to install of normal efficiency.

The long type kiln introduced by Thos. A. Edison is showing up to be a sound step towards improved efficiency, but this process is still too wasteful and leaves much room for improvement before it becomes vital to take up the question of a new type kiln. Mr. Edison's introduction did not change the principal, it is still a rotary kiln, but he managed to get greater efficiency of the combustible, by adding an additional length through which the heat must travel, thus increasing the time of absorption by the cement mixture.

We cannot stop at this stage of the game, after knowing the large percentage of heat that is lost and the possibilities in store for further elimination. Let us take the figures as given by Mr. Rapier R. Coghlan in his report on the "Rational of the Burning of Portland Cement Clinker" in the March issue of "CONCRETE" which gives us a very complete and comprehensive explanation of where the heat of the fuel supplied to the kiln in burning clinker averts to, let us take these figures as a base which show that we have a loss:

Extracted by gases at 1300 deg. F. of	511,517	B.T.U.
Loss by conduction and radiation....	169,371	"
Preheating air to 2600 deg. F.....	132,804	"
or a total consumption of.....	813,692	B.T.U.

from the fuel supplied or an equivalent of 58.12 pounds of coal at a value of 14,000 B.T.U. per pound. If we take a coal generally used showing a heating value of 12,000 B.T.U. per pound, the loss will show an equivalent of 67.8 pounds not considering the heat carried off by the hot clinker. At this rate it can readily be seen that it is vital necessity for someone as Mr. S. B. Newberry stated in a discussion in the February issue of the "CONCRETE." "To do some dreaming and think out things" this can be applied on the subject of these lavish heat losses. This is a subject that the writer has devoted much of his time on in the past few years, having discovered a process by which as per calculations and experiments carried out in his laboratory, would make it possible to save approximately 50% of the present losses and with careful construction and operation approximately 60% could be saved.

This process will not require new kilns, nor will the expenditure to install this process be anywhere near the cost of new kilns. The writers process starts where Mr. Edison left off by building an additional shell around the present kiln approximately three-fourths or even more the distance down the kiln toward its discharge end, where the outer shell enters a dust chamber in the same manner as the kiln now enters the present dust chamber, the stack is removed from the rear end and is placed at the front dust chamber, where the outer shell enters. The operation is the same, with the exception that instead of the kiln gases passing out into and up the stack, the gas is reverted and carried in opposite direction between the present and outer shell, or in other words in the same direction as the travel of the feed, thus insulating the kiln with hot gases.

This also serves as a dust arrestor, due to the loss of velocity of the traveling gases. This additional shell serves as a flue which automatically cleans itself by the rotating action of the kiln.

The lower portion of the kiln is also encircled by a shell, its intake somehow funnel shaped, starting a short distance from the new dust chamber and continues down along the kiln to its end where it enters the hood, so constructed as to create a suction or draft taking in air at or near the new dust chamber pre-

heating it by means of the radiating action over and around the point of the combustion zone, thus administering an extreme hot volume of air in place of partly heated or cold air as heretofore.

This may be better known as the Double Shell Process, serving as a fuel saving device and dust arrestor combined. It is needless to mention at this time the saving possibilities and other advantages yet in store, for anyone familiar with the present rotary kiln process, can readily grasp its features.

News of the Sand and Gravel Plants

A new sand and gravel tipple has been installed by the Franklin Builders' Supply Co., of Columbus, Ohio. The tipple is a huge gravity arrangement operated by steam, and thru it there will be considerable saving in the handling of sand and gravel. This company recently installed a tank which will hold 15,000 gallons of gasoline for the use of its motor trucks. This will enable the company to purchase gas at a lower cost than the usual market price.

An overhead track for the handling of building materials and coal will be built by the Hamilton-Parker Fuel & Supply Co., of Columbus, Ohio. This will be erected on an adjoining tract of land which the company recently purchased for this purpose.

The Herndon Company are closing their Pittsburg, Pa. office and moving their general office to their silica sand and gravel pit at Copley, Ohio in order that they may concentrate all their energies to the production of sand, gravel and silica products.

The River Rock & Gravel Company are operating a Bucyrus electric dragline excavator and a 70-C Bucyrus electric shovel in their plant at Tracy, Calif.

The Columbus Gravel Company, Greenville, Miss., recently organized, has started operations at their pit at Columbus, Miss., daily capacity 70 cars. They use a Bucyrus dragline for digging and loading their material.

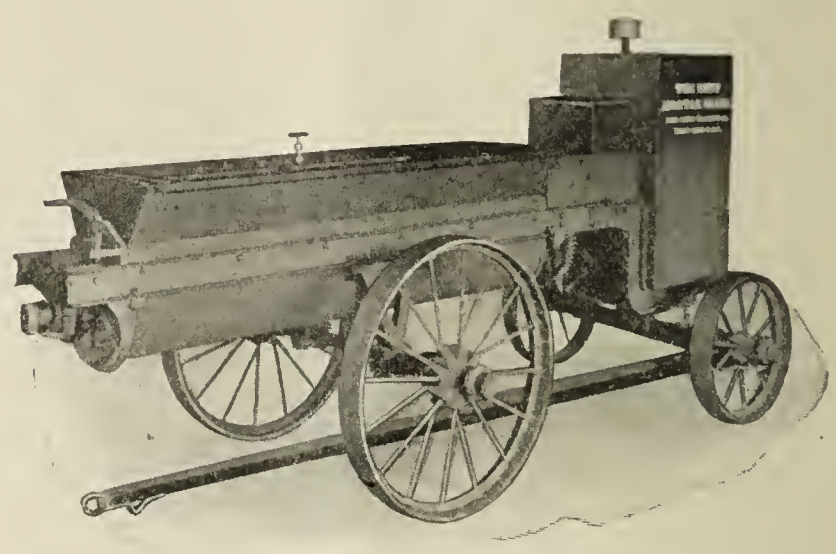
The Muncie Sand Co., Muncie, Kansas, electrified its plant, installing a Westinghouse generator of 300 kw., which is driven by a 450-hp. Corliss engine. This generator supplies power to a 225-kw. motor operating a 10-in. dredging pump. Electric dredge is used to pump the sand from the Kaw river to a bin on the bank with a lift of about 45 ft. The material is screened as it goes into the bin and is loaded onto cars by gravity. Last year the output was 11,083 cu. yds., the capacity of the plant being 2,000 cu. yds. per day.

The capacity of the plant of Riley & Hinker at Menominee, Mich., is being considerably increased by the installation of additional equipment, the present output being 10,000 cu. yds. of sand and gravel annually. A boat equipped with a centrifugal pump recovers the material from the water of Green Bay and conveys it alongside the dock where it is unloaded by a locomotive crane and ¾-yd. clamshell bucket. The gravel is dumped into a hopper from which it flows by gravity into a No. 9 jaw crusher. It is then elevated by a continuous bucket elevator into a revolving screen in which there flows water to wash the sand out of the gravel. The sand and water is turned into a settling box, where the water goes out at one end, the sand being scraped out of the outer and falling into a bin. The gravel is separated into different sizes and falls into the respective bins equipped with chutes to allow the gravel or sand to flow into wagons or trucks for delivery on a job. Crushing, elevating, screening and washing machinery was furnished by the Good Roads Machinery Co., Kennett Square, Pa.

E. G. Mason, Washington, Iowa, is in the market for a sand washer, something that two men could wash from 50 to 70 tons of sand per day. His material has ten per cent clay.

The Kent Mortar Mixer

The Kent mortar mixer illustrated herewith is the best by every test, says the Kent Machine Company, 130 Second avenue, Kent, Ohio. This mortar mixer includes every improvement and convenience for rapidly and thoroughly blending the aggregates, at a labor



reduction which is surprising. Its performance on various jobs throughout the country has shown its great speed, strength and economy. It sustains Kent reputation. Let the manufacturers tell you more about it. Write for catalog and prices.

Effect of Oil on Untreated Concrete Storage Tanks

During the past year three more series of tests were conducted by the U. S. Bureau of Standards to determine the limitations of untreated concrete tanks for storage of oils. The results of tests are summarized as follows in the recently issued report of the Director of the Bureau for the fiscal year ending June 30, 1919:

Series I consists of eighteen 1:2:4 concrete tanks in which were stored 11 mineral oils with gravities varying from 0.742 to 0.959—that is, from commercial motor gasoline to a very viscous residuum oil—5 vegetable oils, and 2 animal oils. In each tank were placed three 6 by 12 in. concrete cylinders, to be broken after an exposure to the various oils. This series was started to determine the volumetric loss of oil due to absorption and penetration of the oils, but it was found that the physical properties of the oils and the temperature changes played such an important part in determining accurately the loss that these tanks were kept under test as qualitative rather than quantitative tests.

After a year's exposure to the various oils, the con-

crete of the tanks and cylinders is apparently unaffected, with but two exceptions. The surfaces of the tanks containing cocoanut and lard oils have been attacked and are considerably roughened. The cocoanut oil was more active than the lard oil, but neither has affected the concrete to a greater depth than 1/32 in., and the penetration observed when the cylinders were broken was 0.2 in. in both cases. The breaking strength of the 6 by 12 in. cylinders showed only a slight decrease when compared with the strength of cylinders stored in air.

Series II and III consist of quantitative and qualitative tests on 1:⅔:1⅓ concrete tanks, in which the maximum sized aggregate is ½ in. The tanks of Series II are under no head, while those of Series III are under a 25-ft. head of oil. The oils used in these tests were vegetable and mineral oils, the latter having gravities varying from 0.649 to 0.970; that is, from very light gasoline to a heavy residuum oil. It was found the losses were greater the lower the specific gravity; that where the specific gravity was 0.875 or higher the losses were very small. The head of oil had relatively little effect on the rate of loss.

In the tanks of Series I and II that contained boiled and raw linseed oils a very noticeable deposit of lime soap was observed. This was more marked in the case of the boiled than in that of the raw oil.

Additional experiments are being started along the same line on 1:1½:3 tanks preparatory to taking up the question of oil-proof coatings to determine their relative worth for treating concrete tanks for storing the lighter oils, for it is evident from the results obtained thus far from the tests that concrete tanks properly constructed are practically impervious to oils with gravities of 0.875 (30° B.) or heavier.

Sharp Sand for Better Concrete

Sharp sand is hard sand, which is the reason it is usually specified. The fact that it is sharp is evidence that it is hard. Round sand is soft sand. The fact that it is round is evidence that it is soft.

All sands, during the ages past, have, on an average, been subjected to about the same amount of abrasion. Sharp sands, on account of their hardness, have withstood this abrasion and are still sharp. Round sands, being soft, the sharp points and edges have worn off. Sharp sand, being hard, wears longer than round soft sand when used in the construction of roadways, pavements and sidewalks—at least twice as long.

The grains of sharp sand have flat sides and sharp angles; they fit flatly against each other, and assist the cement in supporting weight, the angular grains themselves supporting part of the weight. When round sand is used, all the weight comes on the cement.

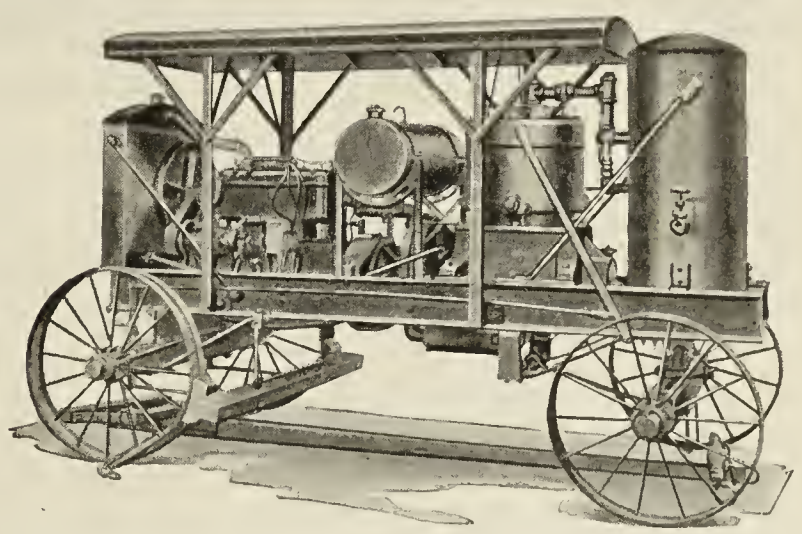
For example: Make a conical pile of round grapeshot, and a similar size and shape pile of broken flint rock. Step on the pile of round grapeshot, and it flies in pieces in every direction; but step on the pile of angular rock, and it supports your weight. Just so with the round sand and the sharp sand. Add cement to these; and, in the case of the round sand, all the weight comes on the cement, but in the case of the sharp sand the flat and angular construction of the grains assist the cement in supporting the weight. Concrete made with a given proportion of cement and sharp sand will support 60 per cent more weight than concrete made with the same proportion of cement and round sand.

Another reason why sharp sand is specified is, the flat sides and angular sharp points and edges of sharp sand fit more closely together than round sand; there are less voids in the sharp sand, and it requires less cement to fill the voids and make a solid stone than when round sand is used. Fifteen to 25 per cent less cement can be used if the sand is sharp than if sand is round, and obtain same strength concrete.

R. L. MARTIN, Ocala, Florida.

A New Air Compressor for Road or Quarry Work

The Sullivan Machinery Company is one of the oldest and largest plants in the world devoted exclusively to the manufacture of rock drills and air compressors. The new Sullivan Portable Air Compressor, gasoline-engine driven, Class "W-K31," wagon mounted, illustrated herewith, is designed primarily for the operation of drilling tools for rock removal, in highway construction. Such work includes the cutting of trenches for sewers, water or gas mains, drilling of ledge in grading, block holing boulders or breaking up large fragments in quarries; or any other rock drilling in which the work is scattered and too small in quantity to warrant a fixed compressor and drill plant at any one point. Other uses of these portable compressors include the operation of air tools for breaking up asphalt, brick or concrete pavements, for riveting, in the construction of steel bridges or buildings, for calking the joints of gas mains, etc.



The new Sullivan "W.K.-31" Portable Air Compressor.

A convenient and effective outfit consists of a Sullivan "WK-31" Compressor and one or two Sullivan Rotator Hand Feed Hammer Drills, Class "DP-33." Such an outfit is complete and entirely independent. It can be used wherever a wagon may be hauled and secures large savings in time, power and labor as compared with hand drilling, or with the use of a heavier tripod drill, operated from a steam boiler. Rotators will drill holes up to 12 feet in depth, without difficulty, for 1¼-inch powder. It will thus be seen that one of these rigs will handle quite heavy drilling work.

Sullivan Portable Compressors have been in successful use for some seven or eight years past. The "WK-31" model represents a complete re-designing, to conform to the demand for a larger air supply, and to take advantage of the advance in design of gasoline engines for service of this nature. The "WK-31" Portable Compressors consist of a two-cylinder, single acting, single stage, vertical air compressor, with hopper jacketed cylinders. Write the Sullivan Machinery Company, 418 Gas Bldg., Chicago, for circular 1775-T, which illustrates and describes this machine.

Jumbo Gravel Digger of Ohio River

Floating, Crushing, Washing and Screening Plant with 1,000-Yd.-a-Day Capacity Fitted with Dining and Bath Rooms Electric Light Plant, State Rooms,

What may well be classed as the jumbo sand and gravel digger of the Ohio river is owned and operated by E. T. Slider, who has yards at both New Albany and Louisville, Ky., at which he handles both sand and coal. The main supply of sand and gravel not only for Louisville, but for much of the surrrounding country, is obtained from bars in the Ohio river by digging.

The sand digger of E. T. Slider is said to be the largest single digger on the Ohio river between Pittsburgh and the Mississippi. In dimensions it is 40 by 265 ft., and it is equipped with a 3-yd. clamshell bucket, operated with a 1-in., steel dredge chain. The normal daily capacity of this digger is 1,000 cu. yd. of sand and gravel.

Housing Facilities Complete

The equipment consists of not only a complete sand and gravel washing and separating plant, but it includes housing facilities for the crew, its own electric light equipment, and everything needed in a self-contained sand and gravel plant.

There are two 100-hp. steam boilers for furnishing the power, and quite a group of engines operating the different equipment.

Equipment

The bucket, which has a maximum reach of 50 ft., is operated by a pair of 13 by 18-in. double throttling engines. There is a 36-in. Symons disc crusher, which is operated by a 10 by 15-in. engine. The sand screens and the bucket elevator for the cleaning plant are operated by a double 10 by 10-in. throttling engine and the pump for the washing plant is driven by a single 9 by 12-in. engine. Then there is a small pair of double engines used to operate the barge pullers on each side of the digger, and another small engine which operates the discharge pipe on the sand chutes.

There is an electric light equipment to supply the dredge with its own lighting. The outfit is also equipped with a cabin which contains kitchen and pantry, dining room, bathroom and six state rooms with accommodations for two men each. The usual boat crew consists of 9 men, 8 men for manning the boat and the digger and cleaning plant, and a cook.

The hull of this jumbo digger was built at the Howard Shipyards in Jeffersonville and the machinery and equipment were installed under direct orders from Mr. Slider at Louisville, so it is really a Louisville product. It was built about two years ago and has been in successful operation ever since.

Plant Operation

The usual plan of operation is to locate the digger over a sand bar with a depth of water that will float the digger comfortably, then work down to about a 50-ft. depth, provided, of course, the material holds out well to that depth.

Sand and Gravel Dredge Screening and Washing Plant Combined and there is a 36-in. Symons Disc Crusher.

The digger includes a complete washing and screening plant and supplies sand and gravel for two yards, one at Louisville and one at New Albany, and at the yards there is an equipment of floats and shovels and hoppers for discharging the barges and yarding the sand and gravel.

Cement Stucco on Concrete Block

By J. E. Freeman, Eng. Tech. Bur.,
Portland Cement Ass'n.

Concrete block for stucco walls should be rough surfaced and of coarse texture, but not weak or friable. Block should be set with cement mortar joints which should be raked out or cut back even with the surface.

Before applying the stucco the surface should be brushed free from all dust, dirt and loose particles and should be wetted to such a degree that water will not be rapidly absorbed from the plaster but not to such a degree that water will remain standing on the surface when the plaster is applied. Too dry a surface will absorb water from the plaster before it has had time to harden properly, and a surface covered with a thin film of water will prevent a proper bonding of the scratch coat to the block.

A 1:3 mixture should be used for scratch coat with the addition of 10% of hydrated lime by volume of the cement which will help in producing an easy working mortar. It is desirable to use three-coat work

wherever possible, but if proper care is taken two-coat work on concrete block can be made fairly satisfactory with a rough cast finish. A smooth or sand finish would be apt to show joint markings after a time unless three coat work was used.

Plastering should be carried on continuously in one general direction without allowing the plaster to dry at the edge. If it is impossible to work the full width of the wall at one time, the joining should be made at some natural division, such as a window or door.

The scratch coat should thoroughly cover the block and be well worked on to insure the best obtainable bond. As soon as the scratch cot has hardened sufficiently to prevent injury it should be heavily cross scratched with a saw-toothed paddle or other suitable device to provide a strong mechanical key. The scratch coat should have a thickness of ½-in. for two-coat work, but for three-coat work it may be ⅜-in.

If a second coat is applied it should follow wherever possible on the day after the application of the scratch coat, the latter being dampened if necessary but not saturated. For two-coat work the rough cast finish should preferably be applied after the scratch coat has hardened for a week, it being sprayed or wetted at frequent intervals during the first few days and kept from drying out. Howeve, if circumstances demand it the finish may be applied the day following as described for the second coat. The tendency to develop surface checking may be greater where this is done, although it is masked by the roughness of the finished surface. The finish coat will average about ¼-in. in thickness. After it has been brought to a smooth, even surface with a wooden float and before finally hardened, it should be uniformly coated with a mixture of 1 sack cement to 3 cu. ft. of fine aggregate thrown forcibly against it to produce a rough surface of uniform texture when viewed from a distance of 20 ft. Special care should be taken to prevent the rapid drying out of this finish by thorough wetting down at intervals after the stucco has hardened sufficiently to prevent injury.

Costs and Better Contracting

Complete Records of Cost Are Invaluable in Estimating and in Promoting Efficiency

By H. G. Christman, President, H. G. Christman Co.

An accurate system of cost accounting has been an important factor in the growth and prosperity of the H. G. Christman Company, and the value of this feature of the contractor's organization deserves great emphasis. The builder must know what the various elements of one job have actually cost before he can prepare a logical bid upon another. Guesswork has no place in modern industry.

In the system that our organization has developed, materials and labor are estimated under fixed general divisions and their sub-divisions. Reference is made, of course, to our cost records on previous jobs, and an excellent idea is obtained of both the amounts to be charged against various parts of the work and of the time required for its completion.

Then during the progress of the work costs are kept according to the same schedule of items as was used in making up the estimate. A schedule has been prepared which first lists the general headings, with their divisions, and then states briefly the nature of the items that are to be charged under each. Copies of this cost distribution schedule are placed in the hands of the superintendent on each job, with the necessary forms for keeping an accurate and complete set of costs. Unnecessary refinement is eliminated, but some detail is necessary in order that the desired figures may be secured.

Bonus Paid Superintendent and Foremen

At the completion of the job, comparison is made between the estimated and the actual costs, and the superintendent is paid a bonus in proportion to the savings he has made. He in turn shares the bonus with the various foremen working under him, on a predetermined basis. At the eginning of the job each foreman is given an estimate of the labor cost, only, on the work that will fall to his men, so that he can always tell whether the work is being done within the estimate, and yet he does not have details as to the total cost of each part of the job.

The bonus is made a liberal one so that a strong inducement is offered to those in direct charge of operations to put forth every effort in securing a good output from the workmen and in developing more efficient methods. The success of such a bonus system hinges upon adherence to fair standards when the estimates are prepared, so that under careful supervision savings worth while can be made.

Anything in Canvas

United States Tent & Awning Co., 225 North Desplaines street, Chicago, is one of the concerns from which any canvas product can be secured. This applies to bales or rolls of canvas, to tents, awnings, paulins and covers of every description in which the factory represents the very best mills in the country and has built up a reputation for integrity. This is the claim of the United States Tent & Awning Co., a claim backed by the record of the house of living up to its commitments. This is better understood, perhaps, when the men identified with the institution are known. They include Edward Litsinger, Edward P. Neumann and S. J. Pilkinton. The company specializes in several features of the canvas trade. A great deal of business is done with the railroads, who buy largely by bale and roll. Shipment can be made direct from the stock of the company, or if more advantageous, shipment will be made from one of the mills the company represents. The company's motto, "Anything in Canvas," is made good by its performance. Covers of every description for every purpose are manufactured and sold to any one needing them. Covers for wagons and trucks, for example, are made with sides, but the ordinary cover is a flat piece of canvas of suitable size, and the size may be anything within reason. A rather unique feature of the business of the United States Tent & Awning Co. is the sale of second-hand canvas covers of every size and weight, which are furnished to general contractors and road contractors for covering freshly cast concrete, materials and for such other purposes as require covers. The canvas that goes into these covers is thoroughly tested and dried before being stored away, and there is no depreciation in its quality from long storage under cover. With the very best materials at its command and the very best grade of highly skilled union tent makers to make its products, the company turns out the highest type of canvas products procurable. Any article made of canvas is made by the company and its facilities are such that very prompt shipment can be guaranteed. A large stock of standard size covers and tents is carried and anything special can be turned out on short notice. The company also carries a stock of Preservo, which is acknowledged to be the best water and mold roof preservative, and if properly used it will greatly prolong the life of canvas.

News of the Crushed Stone Quarries

For storing their explosives the Columbia Quarry Company, Columbia, Ill., E. J. Krause, vice-president, St. Louis, Mo., have erected a neat brick building with a reinforced concrete floor, which is amply supplied with air ducts to insure perfect ventilation in connection with the galvanized-iron vents on the roof.

This building is equipped with properly protected steam heating pipes, and in winter a small traction steam shovel or other form of portable boiler is moved near the house and connected up with the heating system. Thus the power is ready for use at all seasons without the dangerous thawing-out process. The house is provided with a heavy, tight-closing, sheet-steel door with a combination lock, making it proof against thieves. The building is banked on three sides, the entrance facing the quarry, which is several hundred feet away. The purpose of thus banking the sides of the building is to direct the force of any explosion either upward or toward the quarry, where it would do the least harm.

Very few quarry owners appreciate the advantages derived from the use of large-diameter crushing rolls. When properly used there is no type of secondary crusher that can equal them in large capacity, small amount of power per ton of material crushed and cheap maintenance, writes Mr. O. E. Thaleg, Chicago Representative of the Worthington Pump & Machinery Corporation.

Within the past few years several of the more progressive stone producers have awakened to the advantages of rolls and have installed large units for work that had previously been done in a battery of small gyratory crushers.

The Canada Crushed Stone Co., at Dundas, Ont., replaced a No. 7½ and a No. 8 gyratory, which were crushing the product from a double discharge 42-in. gyratory crusher, with two sets of 72-in. dia. by 30-in. crushing rolls. The feed to these rolls was intended to be about 5½ in., but due to the worn condition of the concaves in the crusher it was as great as 8 in. These rolls were fitted with corrugated shells set 1-in. apart and crushed at the rate of 250 to 300 tons per hour each. The product was 50% 1½ in. and smaller, the balance from 2 to 2½ in., with a very few flat pieces which might be called 3 in. ring stone.

Both rolls are driven from one countershaft which is belted to a 250-h.p. motor. The friction load of both rolls, including the line shaft, is about 22 h.p., the average crushing load in 99 h.p. and the maximum 154 h.p.

Another installation of large rolls was made at the plant of the Woodville Lime Products Company, Woodville, Ohio. The product from a 60x48-in. jaw crusher, set to 8 in., was for a time run through a set of 72x30-in. crushing rolls without preliminary screening. These rolls were designed to take the product that would pass through a 7-in. perforation and crush to 2 in., but as the lime plant was not ready to take the large material, everything that came from the crusher went to the rolls. These rolls were driven by a 150-h.p. motor and easily handle all the product produced by the large jaw crusher.

A number of large stone producers have installed equipment of this type.

The Big Rock Stone & Construction Co., Little Rock, Ark., want a mechanic to keep up crushing machinery at their trap rock quarry. Must be thoroughly familiar with Gates crushers.

H. C. Pastorius, for twenty years connected with the Central Railroad of New Jersey and having wide experience in the slag business, has accepted a position with the Emanuel Slag Company. He will handle the sales and traffic of this fast growing company. Their crushers are located at Catasauqua and Glendon, Pa., with their main office at 719 Hamilton street, Allenton, Pa.

Limestone as a necessary ingredient to good farming is being urged by the National Agricultural Limestone Association, of which A. P. Sandles of Columbus, Ohio, is secretary. The Association has secured the cooperation of the Ohio State University in pushing the use of limestone among the farmers. The college has several organizers visiting the various counties, organizing the Ohio farmers into associations for the erection of storage bins for the limestone. Thru this plan the lime will be available when needed, and shipments will not delay the farmers when the car shortage becomes acute. The plan is being adopted enthusiastically.

The housing problem will be solved by the Thomasville Lime & Stone Co., Thomasville, Pa. They are erecting ten houses, to be used by their employes at the plant.

The Limestone Products Company, of Memphis, Tenn., recently organized, are building a crushing plant at Black Rock, Ark., to have daily capacity of 1,500 tons. They will use a Williams hammer mill.

Preston Crushed Rock Co., Preston, Minn., has received most of the machinery to be installed in the mill and expects to be ready for active operations in June. Considerable excavating will have to be done and a side track put in. The outfit is entirely modern. The crusher will have a capacity of 45 tons per hour. Other equipment consists of a compressor with necessary air drills and a 25-horsepower electric motor, which will be attached to an extension of the Power Company's lines.

Frank Sharp, of Lynchburg, Ohio, is retiring from business on account health and has for sale, lease or rent a fully equipped crushed rock and lime plant with highest testing blue limestone in southern Ohio, testing 94.20% calcium carbonate. Fine location for a large lime or cement plant. Fifty acres of a forty-foot ledge of stone with light stripping. Plant has been in operation for five years with increasing demands and good results.

The St. Paul Stone Company of Hastings, Minn., has purchased the old McDermott tract across the river from Hastings and will extend the quarry operations there and start two rock crushers shortly.

News of the Concrete Products Factories

WHAT the average manufacturer of concrete products needs nowadays is more selling ability, a keener scent for sales possibilities.

Of course, he should know the plant end of his business—that a sack of cement has an elastic limit, that a 12-inch block can't be sold for 15 cents without grief somewhere. It's a wise merchant who knows his own business.

But blocks draped more or less artistically over the surrounding landscape will not, by any alchemy, turn into money of their own free will.

There is many a man of six-cylinder possibilities delivering one cylinder results. Knowledge of the business will keep the one cylinder hitting; energy and enthusiasm in selling will spark the other five.

Billy Sunday or any other live wire could lose an arm and a leg and give most of us lessons on how to work up sweat.

There may be some question as to Billy's method; there is no question as to his ability to get there.

He's a living proof of what we all know and always have known—that the selling instinct, enthusiasm and knowledge of our business will make us howling successes.

Lackadaisical interests and bury-the-dead methods won't disturb any man's daily snoozes.

The dodo and the one-lung buzz-wagon are relics of the past. So is the merchant whose sales activity is confined to an occasional listless "Anything else?"

The harder we hit the ball, the further she will travel.

Remember, he who soweth little, hath little need of corn cribs.

And advertise. He who tooteth not his own horn, the same shall not be tooted.

A Goodlett Vibrator (a motor vibrated platform for consolidating concrete) is being used in the factory of the Camp Culvert Form Co., Chicago, making precast concrete culvert sections and laundry trays. It is believed that with the agitating device it is possible to solve a problem that is a serious one to the manufacturer of such products as laundry trays and burial vaults and other products having thin sections to be filled with concrete around a reinforcing mesh. This vibrator is manufactured by the Monolithic Machine Co., 359 Peoples Gas Bldg., Chicago, Ill.

The Waukesha Cement Tile Company, Waukesha, Wis., has been incorporated at $60,000 by L. H. Waite and T. G. Wilder.

Flink & Smith, manufacturers of Flink's perfect Silo Seal, will start up the manufacture of this famous contrivance in La Salle, Ill.

They will employ between 10 and 15 people in their new factory and later will expand the business and will probably employ a greater number.

The product, which has attracted wide attention, is a flexible asphalt treated product, and is made to hold approximately 10 tons of water. It fits snugly into the top of a silo and keeps it air tight, falling as the ensilage taken out.

The Cunard-Lang Concrete Co., Columbus, Ohio, has booked a number of large contracts during the past few weeks according to the officers of the concern. The company recently installed a number of new methods and other equipment that enables it to handle practically every kind of concrete products. The officers of the company are L. D. Haggerty, president; J. F. Bott, vice-president; F. R. Schwartz, treasurer and George Lang, Jr., secretary and general manager.

The Waupaca Sand & Gravel Co., Waupaca, Wis., operate a modern concrete products factory specializing particularly in concrete sewer pipe, drain tile and concrete blocks. The machine makes sewer pipe ranging in diameter from 4 to 24 inches. The company occupies the time profitably during the winter months especially, in manufacturing concrete products, at the time when business at the gravel pits is suspended.

The W. E. Dunn Mfg. Co., 414 24th Street, Holland, Mich., has recently placed on the market a concrete mixer designed primarily for concrete products factories. It is built to meet the demand in present day plant operation. Its performance in various parts of the country has shown its great speed, strength and economy.

The Artisan Cement Products Company, Elkhart, Ind., manufacture molds for making ornamental concrete porches, bases, spindles, caps, railings, etc. The company also operate a modern concrete products factory.

G. E. Warren has resigned his osition as Assistant Manager Service Bureau of the Universal Portland Cement Co., Chicago, to continue his duties as Manager of the American Concrete Pipe Association. Mr. Warren has been with the Service Bureau of the Universal Co. for five years during the last year of which he has also acted as Secretary-Treasurer of the American Concrete Pipe Association.

This association has recently been reorganized and will open an office in Chicago with sufficient help to carry on its broadened activities.

Mr. Cecil L. Gatten, proprietor of Hills Cement Block Works, Hills, Iowa, now uses waterproofing compound in all his blocks as they show a decided gain in density. From his experience a good waterproofing compound will make a dry tamped block permanently impervious and useful. He has also used water-proofing in poured blocks and finds it successful there too It was in line with the policy of "quality first" that he investigated the properties of waterproofing compounds as he wanted to make better blocks and to be better, he says that they had to be waterproof.

Burgess & Grantham Co., 1123 25th St., Newport News, Va., wants names and addresses mfrs. concrete products mchy.; such as pipe, posts, blocks, ornamental trimmings, vases, etc.

The Cameron Bridge Co., located at Cameron, Mo., started manufacturing concrete products in 1914, and in the words of J. C. Dildine, engineer of the company, the start was made with a fountain pen, a set of drawing instruments and a lot of nerve.

Realizing that hauling concrete materials from a railroad to a plant would involve considerable expense for drayage charges, a tent for storing cement was set up adjacent to a railway siding and the first

work done in the open. Mr. Dildine says that it is necessary to make quality products and that making cheap goods will result in the business going to competitors. This he believes is especially true in the matter of concrete building blocks.

Included in the list of units made by the company are poured concrete building blocks, manufactured in MacArthur molds, concrete culvert sections designed and patented by the company, concrete pipe, silo staves, roofing tile and fence posts. The present demand for fence posts exceeds the capacity of the plant as this is but one of the several items made by the company, and attention must be paid to all parts of the business, which also includes bridge work, concrete foundations buildings, sewage disposal plants, etc.

Now the company's books, in addition to orders for products, are contracts for the erection of a concrete block garage, 40 by 100 ft., an addition to a wholesale grocery ,a filtration plant at Cameron, several steel bridges with concrete foundations, and reinforced floors.

The present plant includes a shop building 112 by 160 ft., into which runs a spur track from the railroad. This spur reduces the cost of unloading raw materials and loading finished products to a minimum.

Charles White, of Bluffton, Ind., sold his concrete products plant to George Swartz, the latter taking possession at once. Mr. White has successfully operated in this city for fourteen years building cement blocks and burial vaults. Mr. Swartz will continue to manufacture the same products at the old location on West Ohio street.

The Milton Cement Products Co., Milton, Penn., report business very good. They operate Hobbs, Hayden and Pettijohn Concrete block machines, Ohio post molds, Wettlaufer brick machine, Dunn sewer pipe molds, Blystone, Koehring and Wonder mixers.

J. W. Stewart, La Porte City, Iowa, is enjoying a busy season. He operates a Schenk drain tile machine, D & A post molds, Northwestern sewer pipe molds and brick machine and a Stewart mixer. He is in the market for second hand 18" poured molds for concrete sewer pipe.

The Corinne Concrete Pipe Co., R. F. D. No. 1, Brigham, Utah, are behind on orders having considerable work on hand. They operate four Dunn tile machines and a Besser tile machine. They have considered installing a sewer and drain tile machine.

The Concrete Products' Association of Akron is the name of the youngest organization in the building industry in Akron. It was organized May 8th. G. E. Probert, of the Akron Cement Products, was elected president; T. S. Mooney, of The Mooney Art Stone Company, was elected vice-president, and Mr. W. E. Bellany, of the North Hill Cement Block Company, was elected secretary. The board of directors consists of Fred Crisp of the C. & B. Sand & Block Company, F. A. Owen of the Owen Cement Products Company, J. E. Mackey of the Borst Cement Block Company, and A. L. Post of Kent, Ohio. Mr. Post is the inventor of the Kent Continuous Mixer, which is used by practically all of the cement block manufacturers. The organization will take up the standardization of cement blocks, and for this purpose a committee on legislation was appointed, consisting of Mr. T. S. Mooney, Mr. F. A. Owen and Mr. W. E. Bellamy, which will investigate the necessity of having a section on the building code which will require all building block to conform to a certain standard test.

The Concrete Pipe & Construction Co., N. M. Ball, manager, Porterville, Calif., has recently closed some large contracts for concrete pipe. They operate Blystone, Smith, Koehring, Lansing and Austin Cube mixers and are in the market for a good pipe machine for concrete pipe for irrigation. Not Tile.

The Wataunga Cement Products Corporation recently incorporated capital stock, $5,000. W. W. Smith, president, Elizabethton, Tenn.; W. Lewis Smith secretary and treasurer, Johnson City, Tenn. Mr. D. S. Boy, industrial representative of the Carolina, Clinchfield & Ohio railway, Johnson City, Tenn., writes us that the Wataunga Company was organized for the purpose of manufacturing concrete staves for silos and tanks, and other purposes. They will use Plaford Mfg. Company's molds and will specialize on the Ribstone stave. This company will add other products to their line in the near future.

Hans Bielen, Box 83, Springfield, Minn., wants to correspond with manufacturers of cement tile machines and cement brick machines to have output of ten to twenty-five thousand brick per day.

At the plant of the O. C. Barber Concrete Products Co., Barberton, Ohio, they polish their dimension stone and other concrete products with a carborundum disc on a polisher driven by a flexible shafting. There are a number of such polishing equipments on the market now and the working heads can be fitted with grinding discs in various degrees of fineness and in various shapes to get at different kinds of work, some being suited to cutting out very fine details. The Carborundum Co., Niagara Falls, N. Y., and the Cavicchi Polishing Machinery Co., Quincy, Ill., manufacture polishing equipments.

T. K. Leedy, Graham, Va., will establish a plant to manufacture cement brick to have daily capacity of 5,000.

The Wells Cement Products Co., Wells, Minn., has been incorporated to manufacture and deal in cement products. The capital stock is $50,000 and the officers are J. W. Hurst, president; F. J. Kinney, secretary, and Claire Hurst, treasurer. They are now getting started to manufacture, having placed an order with Wm. H. Hale Co., 609 Fifth Ave. S., Minneapolis, Minn., equipment dealers, for a drain tile machine, block machine, mixer and silo molds. They will make blocks 8x16 which will be sold for 20 cents apiece. Are interested in roofing tile, sewer pipe, fence posts, burial vault molds and waterproofing compounds.

Lange Bros. of Champaign, Ill., are purchasing additional machinery for their burial vault plant. They have more business than they can take care of. Last year this firm manufactured 285 concrete vaults and they declare they have made a vault every day this year. They operate Norwalk Vault Co.'s burial vault molds, Walter Concrete Roofing tile machines, Hobbs block machines, making blocks 8x8x16 that sell for 20 to 25 cents, Kramer automatic tampers and a Blystone mixer.

The cement block factory situated on State street, Grinnell, Iowa, and owned and managed for some years

Cement and Engineering News

Vol. 32 Chicago, July, 1920 No. 7

Better Corncribs and Granaries Demanded

With the increased popularity of the cement stave silo has come the use of cement staves for building corncribs and grain bins. Contractors who have taken up this kind of work are finding a ready market for these structures. Too often the corncrib or granary gives little protection at all against fire, rats and mice. Grain is too valuable to allow waste in ways so easily preventable. Practically every farmer in the country is a prospect for a permanent grain bin or corncrib, especially when they can be built at little or no greater cost than the ordinary wooden building.

The Caldwell Silo Co., of Oskaloosa, Iowa, says: "We have found that the crib and granary business is coming rapidly. We built our first crib in 1917. This was an experimental one. Since then we have developed many new features that only time and effort can produce. Last year we built 19 cribs without any particular advertising or solicitation. Most of these were sold on the merits of the first. This year we expect to put out at least 75 and possibly 100 from our Oskaloosa plant."

The grain bin differs but slightly from the usual cement stave silo. In the corncrib, however, provision must be made for ventilation. This is accomplished by the type of stave used and by a ventilating flue at the center of the crib. The stave is 10 by 30 by 2½ inches, with two openings 4 by 9 inches, and is reinforced with four ¼-inch rods which runs through the length of the openings. The rods prevent ears of corn from falling through the openings and at the same time keep out rats and mice. Before the concrete floor is laid, a number of lines of 8-inch tile are placed which lead from the outside of the foundation to an opening in the center of the crib. The ventilating flue is built up around this opening with 8-inch block laid on edge so that the openings extend through the wall. The flue is capped with a metal hood and in connection with the open staves gives splendid ventilation. In fact, corn stored in the first crib of this type in 1917 when corn in Iowa was very soft, kept in better condition than that in other cribs.

The fact that concrete cribs and granaries are both fireproof, ratproof and permanent, gives the builder a very strong sales argument. These advantages combined with low first cost make a selling combination which cannot be excelled.

The Heim Cement Products Co., North Liberty, Ind., recently supplied their cement staves and erected for a local coal dealer, five storage bins for coal. Each bin is 20 ft. in diameter and 13 staves, or 30 ft. 4 in. high. Sufficient reinforcement is provided by 9x16-in. rods encircling the pocket and placed 9⅓ in. apart.

It is obvious that this kind of construction would be peculiarly well suited to the storage of sand, gravel and crushed stone.

How to Get Full Value from Rubber Belting

To obtain the full value from a rubber belt, provide pulleys of ample diameter and face, avoid excessive strain, see that the strain is equally distributed over the entire width of the belt and that the fastenings are so made as not to pull out the ends, avoid having the belt unnecessarily exposed to excessive heat, grease or dirt, and remember to shift slowly and carefully.

Belts to be adjusted to the pulleys should have the ends cut square and true and be cut shorter than the distance around the pulleys by ⅛ in. for every foot when measured with a tape; a steel tape is best.

All belts should be put on with proper tension, but they should not be stretched too tight, as they are apt to pull the shafting out of alignment. With wide belts this can be done best by the use of clamps secured firmly to each end of the belt and drawn together by bolts running parallel with an outside the edges of the belt. There is no danger of breaking, as a belt of the better quality—6 ins. wide and 3-ply thick—will stand a strain of 5,000 lbs. and other sizes in proportion.

Should the belt slip from dust or other causes—which seldom happens—it should be lightly moistened on the side next the pulley with boiled linseed oil; if one application does not produce the desired effect, it may be repeated.

If the belt is to be shifted from one pulley to another, rollers should be placed on the shipper on each side of the belt, in a diagonal position, bringing the upper ends of the rollers as near together as possible to clear the belt and diverging from each other at the lower end as far as may be; thus, when the shipper is used, pressing upon the face of the belt instead of upon the edge. This plan ships the belt much easier than the old method and entirely prevents the liability of injuring the edge. The seam side of the belt should not be placed next to the pulley.

Improvement in Road Construction

C. M. Wood, formerly sales engineer for the H. W. Johns-Manville Company and a man of wide experience in road engineering and highway construction, has assumed charge of the recently established good-roads bureau of the Goodyear Tire & Rubber Co. of Akron, Ohio, and will devote his entire time to its work throughout the United States. Mr. Wood is a native of Texas and a graduate of Cornell University

as a mechanical engineer. He followed engineering work for eight years, then for two and a half years was engaged in sales engineering for a Chicago cement company. He was also at one time department manager for the Portland Cement Association. In the same spirit which prompted the Goodyear company to go to the aid of the Lincoln Highway when help was sorely needed. its good-roads bureau has been established under Mr. Wood's management. It is to work for the promotion of good roads, paying especial attention to seeing that hard-surfaced roads are so constructed that they will be adequate for the needs of transportation in future years, that they are wide enough for trucks to pass without getting off the hard surface, that there is proper road drainage, and that foundations are laid correctly. Recently Mr. Wood has been in conference with E. B. Smith, testing engineer of the Bureau of Public Roads, Washington, and they will endeavor to determine the destructive effects of impact forces upon road surfaces, and to ascertain proper road surfaces, type of construction and foundation best suited to withstand such impacts and to increase road durability. Machinery testing is now under construction.

Forgotten Items in Contracts

In a recent paper by D. S. Colburn, published in the *Contractors' Atlas*, the author analyzes the cost estimate of a 130 x 200-foot three-story school building for which the usual items of labor and materials, plus 10 per cent profit aggregated $139,243.96, and showed how the contractor stood to lose nearly all of his legitimate profit by overlooking a number of ordinary vital expenses that go to make up the necessary general cost or overhead expense.

These consisted of bonds fire insurance, liability insurance, telephone, traveling expenses, temporary office, water supply for construction purposes, watchman, time-keeper, engineer for laying out, etc., protection of work, temporary heating, cleaning building, carting debris, and cutting and jobbing for other trades, making a total of $9,005 which, plus the original estimates and the 10 per cent profit on the whole, made the correct bid $149,149.46.

Even this addition is inadequate because neither estimates provided for interest on capital, office expenses, salaries, cost of estimating, waste deterioration of plant, loss of tools or contingencies which together should be provided for by several thousand dollars more according to the magnitude and nature of the contractor's total business.

Report on Corrosion Tests

With a view to determining whether or not the presence of lime in mortars and other building materials prevents the corrosion of metal used as reinforcement, the chemical laboratory of the National Lime Association, Washington, D. C., has recently made up slabs of various materials used in building operations both without lime and with varying quantities of lime in which polished steel rods are imbedded. In one series the slabs are cured for different periods in air only, while in duplicate series they are immersed at regular intervals in water for five-minute periods.

The thirty-day breaks have been made on corrosion test slabs of the following materials:

Lime Plaster (high calcium and high magnesium).
1-2-4 Concrete without lime.
1-2-4 Concrete with 5 per cent lime.
1-2-4 Concrete with 10 per cent lime.
1-2-4 Concrete with 15 per cent lime.
Gypsum without lime.
Gypsum with 5 per cent lime.

The air-cured gypsum slab showed practically the same amount of corrosion of the steel rods as in the case of the two-week break, while the slab which had been dipped in water showed a considerable increase in the amount of corrosion. In the case of gypsum containing lime no corrosion was visible in EITHER THE AIR- OR WATER-CURED SAMPLE.

None of the other slabs showed any corrosion of the steel.

Leaks Stopped by Bag Cleaning

Cement costs money, and the cloth bags cost money. Contractors and other users of cement first awoke to the economy of handling empty sacks properly. The war-time campaign to reduce textile wastes doubtless helped spread the idea. So today the sack-baling department of the average contracting organization is, though small, a mighty important factor in the leak-stopping effort.

Now, users of cement are coming to realize the folly of shipping half a pound of good cement back to the manufacturer, thus losing the cement and paying unnecessary return freight.

George M. Gross, La Porte, Ind., "builder of modern roads," reports that last season on a road job at Hortonville, Wis., he recovered 200 sacks of cement from 100,000 "empties" that he cleaned in a Unit sack cleaner, manufactured by the Handy Sack Baler Co., 620 S. Second St., Cedar Rapids, Ia. In addition to saving the cement and the return freight on it, he reports that cleaning cloth sacks before they go to the bag bundling machine makes the trademarks on the sacks legible and thus facilitates getting the sacks back to the right manufacturers.

With the same kind of a machine for cleaning bags, B. H. Kelly, manager of the Interstate Material Co., Davenport, Ia., reports that he cleaned 20,000 returned sacks and got an average of 7½ bags of cement out of every thousand sacks, which shows that the cement the contractor overlooks can be recovered by the dealer if the dealer as an opportunity to clean sacks before they are baled for return shipment.

The Traylor Superpump

Cement & Engineering News is in receipt of a copy of Traylor Engineering & Mfg. Co.'s new bulletin 101—The Superpump and Hydraulic Machinery.

This bulletin fully illustrates ad describes their new power pump, "the best pump on the market for any services," writes the Traylor Company. We will say the best pump, for it is heavier, designed with a greater factor of safety and manufactured with the same care that has made the name "Traylor" known the world over for mining machinery of the very highest class obtainable.

We believe this bulletin is very complete, and contains a great deal of information that will appeal to the users of pumping machinery.

Sand and Gravel Industry Being Driven Into Bankruptcy by Official Order Withholding Cars

The National Association of Sand and Gravel Producers has filed a petition with the Interstate Commerce Commission praying for a hearing before July 1 on Order No. 8, which turns over for 30 days all open-top cars east of the Mississippi River to the coal industry. The application points out that the sand and gravel industry is being driven into bankruptcy by the operation of the drastic policy of the commission.

Application for a Hearing on Modification of Order No. 7 by the National Association of Sand and Gravel Producers.

Since the railroads have been turned back to private ownership and the Interstate Commerce Commission has been charged with responsibility, various orders on car service have ben issued by or with the consent of the commission, culminating in Service Order No. 7, issued by the Commisison itself June 19, 1920, effective June 21, 1920.

To date the general effect of these orders has been such as to practically put out of business the sand and gravel industry. The evil consequences growing from this situation to the public at large, supplemented by the unquestioned disaster that will shortly overtake this industry, prompts this request for a hearing before the full commission, to the end that the building and construction problems of the nation may be adequately surveyed.

In so far as these orders touch this branch of the building industry we beg to submit the following considerations:

(1.) Sand and gravel is the basic need of the building industry; without it other building materials cannot be used. Denied a means of transportation, the industry itself, as well as the entire construction program of the country, faces complete paralysis.

(2.) Sand and gravel can be transported in open-top cars only. It is the only building material which cannot be transported in any other type of railroad equipment.

This statement is grounded in fact. The mechanical equipment of the industry permits loading only in open-top cars. In the very nature of things the unloading requires the same type of equipment.

In making this suggestion it is not our desire to in the least handicap or differentiate our need from other branches of the building industry. We simply state the unquestionable fact:

Open-top cars are essential to the movement of sand and gravel.

(3.) Open-top cars have been denied this basic construction necessity. Service Order No. 7 takes from this industry the only means of transporting its product.

There is little or no succor in that part of the commission's order which allows this industry to use open-top cars when such cars are "moving in the direction of the mine or mines to be supplied." The nation's construction and building program is, for the most part, in and around the great commercial centers; the movement of open-top cars "in the direction of the mine or mines to be supplied" is largely in exactly the opposite direction.

(4.) The sand and gravel business is a seasonal business. Normally the season is from April to November, sometimes until in December. Supplying this seasonal trade are from 1200 to 1500 well-equipped plants scattered throughout the United States. These plants represent an investment running into the hundreds of millions of dollars.

The continuation without modification of Service Order No. 7 means bankruptcy to these plants. Indeed, the few days during which the order has been in effect have seen an appreciable number of these plants completely close down. Enforced for the full 30-day period, and the entire industry will face ruin.

(5.) Besides being a seasonal product, sand and gravel, unlike lumber, brick and other of the construction and building materials, cannot be stored at central points for local distribution; this due to the inherent characterestics of the product, the manner of its handling and the method of its use.

(6.) Our plants are widely scattered throughout the nation, and are very largely operated by machinery in control of skilled labor. The industry cannot maintain itself other than upon a going basis. Without open-top cars it cannot be kept upon a going basis. If not kept on such basis this labor will scatter—in fact, is now rapidly leaving our plants. If we lose our labor, open-top cars or any other means of transportation will avail nothing. Considering the general labor shortage, this circumstance means irreparable disintegration of an industry absolutely essential to the economic life of the nation.

We submit further:

That whatever salutary effect the commission intended Service Order No. 7 to accomplish has failed of realization.

That terminals are congested.

That coal prices have not been lowered.

That the transportation facilities of this country have been turned over to one industry to supply its product to manufacturers and others engaged in economically non-essential callings, while for lack of this same equipment, or a part thereof, other industries of unquestionable economic essentiality are facing ruin.

That these industries thus affected are rightfully entitled to their proportionate share of the available equipment which this order denies them.

That the effect of this order violates two fundamental principles.

First—When a shortage of transportation facilities exists, as is the case at the present time, the shortage hould be borne by all shippers pro rata.

Second—Priorities and embargoes are contrary to all sound business principles.

That at this critical period to penalize and paralyze other industries in favor of one industry, and at the same time penalize and paralyze the nation's vital construction and building program, is to create a condition economically so unsound as to challenge the immediate attention of those interested in any way in the future welfare of this country.

It is devoutly hoped by your petitioner that the meritorious purpose of Service Order No. 7 will be accomplished. In so doing, however, it is not necessary to destroy this industry.

In making this request for a hearing we are fully apprised of the grave problems that confront the com-

mission. It is not our desire to in the least embarrass or burden the commission with our peculiar industrial problems. It is our thought, however, that in issuing the order referred to, wherein this industry has been practically placed in a helpless position, the commission did not have before it all the facts, and we are convinced that if given the opportunity to develop and explain these facts the commission will make such modification of its former order as to permit this industry to live; and this especially in view of the fact that the sand and gravel industry is seasonal in character, and relief, if at all, must be immediate.

Owing to this urgency and to the critical situation in which this industry now finds itself, your petitioner is furnishing each member of the commission with a copy of this request, in order to conserve the commission's time, and also suggesting that only a brief hearing will be necessary, which hearing, if granted, should be held not later than July 1, 1920.

Respectfully submitted,
NATIONAL ASSOCIATION OF SAND AND GRAVEL PRODUCERS,
Indianapolis, Ind.
By E. GUY SUTTON, Business Manager.

Industrial Housing Project

By the U. S. Housing Corporation at New Brunswick, N. J.

The significant feature about industrial housing is, that no amount of industrial prosperity, and, moreover, no leadership in international industrial competition, can be secured without giving proper consideration to the working classes. Upon the well-being of these classes, including the farmers, mechanics, the skilled and unskilled workmen and the small shopkeeper, depend the economic strength and prosperity of the nation at this time.

The war has given a prominence to industrial housing it did not possess in the past.

The United States Housing Corporation at New Brunswick, N. J., has recently built these homes for workmen. Herringbone and surety lath were used in construction, showing that big business realizes the responsibility enjoined upon it—that of maintaining the home comfort of employees.

Architects: Trowbridge and Livingston, New York City. Builder: John Lowry, Jr., C. E., New York City.

Sack Cleaning Machine Saves Money

In cleaning by machine 100,000 cement sacks on a concrete road job in Wisconsin 200 bbl. of cement were recovered. A bundle of 60 sacks, after cleaning, thus reducing the freight charges on reweighed 25 lb., as compared with 50 to 75 lb. before turned sacks. Altogether the contractor estimated that he saved $1,000 on his cement sack account.

Modern Stucco House

U. S. Housing Corporation Cement Stucco House

Stucco House Built at New Brunswick, N. J. Herringbone Metal Lath Used

A New Type of House Construction—Frame and Stucco System

The difference in cost between permanent and temporary construction is so small, after taking into account the necessary expenditures for water supply, drainage and road work, that it is poor economy to throw away any money upon makeshift expedients. The day of the temporary home is fled. The advent of a new concrete frame and stucco system—an entirely new idea in concrete construction, sounds the knell of the wooden frame house.

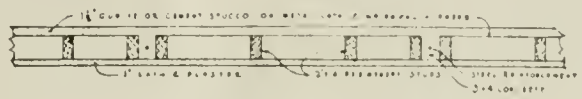
Thanks to this invention, concrete homes may now compare most favorably in cost with ordinary wooden houses; two houses may be built as economically as two hundred; a different style of architecture may be employed in each house if desired. Expensive forms, the bugbear of past housing operations, may be entirely eliminated and fire-resisting, permanent homes, needing neither paint nor repairs, erected.

Semi-Detached House, South Ardmore, Pa., Constructed of the Ballinger & Perrot Concrete Frame and Stucco System

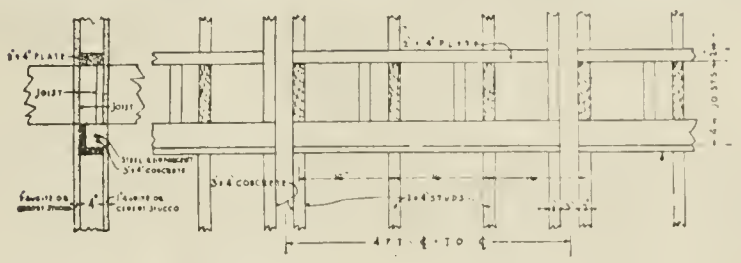
Not one solitary reason for a temporary home exists today.

Cement stucco on metal lath over reinforced concrete frame, produces a wall construction which is not only rigid and permanent, but possesses the insulating qualities so essential in exterior wall work by having dead air space, thereby keeping the building warm in winter and cool in summer.

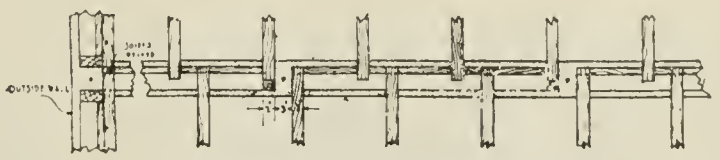
The photographs on this page show a new type of construction developed by Messrs. Ballinger & Perrot, of Philadelphia, and differs in some essentials from any type of house now in use. A wood frame is erected as shown in the perspective. Every fourth stud is doubled and the intervening space is filled with concrete, forming a reinforced concrete stud or support every four feet. At the floor lines a beam is formed



Plan of Outside Walls



Elevation Showing Party Wall Framing (For Granite or Cement Stucco With Forms).



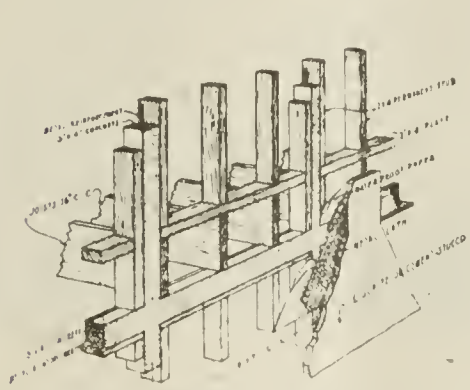
Plan of Joists—Party Wall

Plan of Party Wall

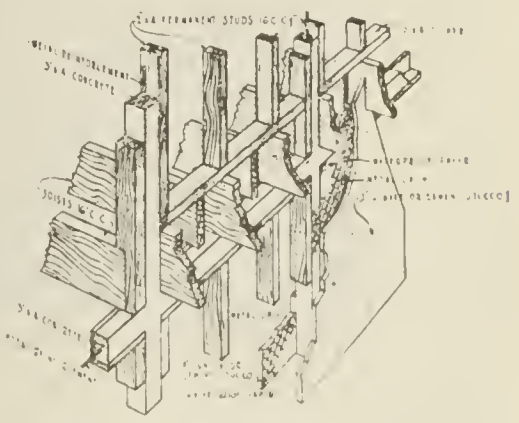
for the purpose of bracing the building and stiffening this concrete skeleton.

The exterior walls are then stuccoed on Herringbone metal lath attached to anchors previously placed in the concrete studs and to the wood studding between. Interior plastering is on Herringbone lath. This type of dwelling may be erected at a very slight advance over wood construction and its design is such, that in the event of fire, the entire structural portion

Frame Covered With Herringbone Rigid Metal Lath and Concrete Frame Poured.



Perspective Showing Side Wall



Perspective Showing Party Wall

of the building would remain intact, preventing the spreading of flames and could, with very little expense, be placed in its original condition.

The concrete studs and horizontal beams surrounding the building prevent vibration and the formation of cracks in the plaster and stucco.

Exterior View Showing Waterproof Paper and Herringbone Rigid Metal Lath in Place. Concrete Studs and Beams Cast.

The details show the application of the proper gauges of Herringbone metal lath to the exterior and interior walls.—Published through the courtesy of General Fireproofing.

NEW YORK ADMITS LIME TO CONCRETE

One of the most important and far-reaching decisions of recent years is expressed in the ruling made by the Board of Standards and Appeals of New York City on April 19, 1920.

Many experienced engineers and contractors have long felt that the building codes of all our cities should officially recognize the value of admixtures of hydrated lime in concrete construction, the practical value of which has been repeatedly demonstrated by results in the field.

This matter came before the Greater New York Board as an appeal for a ruling touching the specification for hydrated lime in the concrete work on a large building in that city. After holding numerous hearings and securing testimony from all available sources, the Board adopted the following ruling:

"The use of hydrated lime in all classes of concrete construction shall not be prohibited when used in accordance with the condition hereinafter set forth.

"The hydrated lime shall conform with the standard specifications for this material which have been adopted by the American Society for Testing Materials.

"The maximum amount of hydrated lime which may be used shall conform with the following table, all weights given being the amount of lime which may be incorporated for each ninety-five pound bag of Portland cement used.

1-1½-3 mix; 4 lbs. of hydrated lime per bag of cement.
1-2 -4 mix; 5 lbs. of hydrated lime per bag of cement.
1-2½-5 mix; 6 lbs. of hydrated lime per bag of cement.

"For hand mixed concrete, the hydrated lime and Portland cement shall be well mixed while dry.

"Hydrated lime shall not be used in concrete which is to be deposited under water."

This decision is a clear-cut recognition, from an authoritative source, of the fact that the addition of hydrated lime in general concrete construction has definite advantages for certain purposes. Bulletin 302, entitled "Improving Cement Products," issued by the National Lime Association, Washington, D. C., deals with practical considerations of this character.

Book Reviews

Useful Data on Reinforced Concrete Buildings for the Designer and Estimator.—By the Engineering Staff of the Corrugated Bar Company, Inc. Leather; 5x8 in.; pp. 216; illustrated; $2.50. Sent on receipt of price by Cement & Engineering News, 22 Quincy St., Chicago, Ill.

With so many variables in the subject of the design of reinforced concrete structures, it would seem almost hopeless to make up a "handbook" on the subject. However, this handbook, just published by the Corrugated Bar Co., of Buffalo, seems to answer all that might be desired in such a book. In fact, it is a parallel, in size, shape, and contents, to our familiar Carnegie, or Cambria of the steel companies. A "Useful Data on Reinforced Concrete Buildings," a Carnegie "Pocket Companion," and a "Structural Timber Handbook" (by the West Coast Lumbermen's Association), form a trio that are time savers and invaluable to the engineer who understands and appreciates the fundamentals of good designing. All handbooks are dangerous in the hands of the inexperienced.

"Useful Data" is in no sense an advertisement; in fact, deformed bars are not particularly mentioned. True enough, under the head of "Flat Slab Tables," the "Corr Plate Floors" have their place but so do the Flat Slab Floors, according to the Chicago Rulings and Joint Committee Recommendations.

A few pages are given over to a restatement of the ordinary reinforced concrete theory. Curves for the values of k, j, K, and p, for the usual values of n and f_s and f_c for various kinds of beams follow. Continuous beams are very well presented. Tables on slabs, clay tile slabs, ribbed slabs, rectangular beams, tee beams, occupy some 40 pages. Columns are given according to the New York City Building Code, Chicago Building Code, and the Joint Committee Recommendations. Square, round, tied, and spiral columns of all sizes are given. Footings, piles and retaining walls are well illustrated and detailed. Quantities for estimating purposes are included; straight steel, spirals, column and beam areas and weight and moments of inertias, column capitals, etc., are included under this. Pages of ordinary useful data are followed by specifications of various kinds, and the final report (July 1, 1916) of the Joint Committee is given in full. A good subject index completes the books.

Truly, according to the preface, text books deal with method and theory of design; this book gives quantitative results. The book is offered, according to the statement of the publishers, at a "nominal price, merely covering the actual mechanical cost of printing and binding."

Concrete Building Estimates

Estimating Concrete Building.—By Clayton W. Mayers. Boston, Mass.: Aberthaw Construction Co. Cloth; 6x9 in. pp. 51; illustrated. $1.

This is a complete though condensed exposition of a method of estimating the quantities in a reinforced-concrete building, with examples carried out for a typical structure. It should be very much worth while to those who are not fully informed as to such practice. It is announced that while a price has been put on the book, the Aberthaw Construction Co. will provide free copies of architects and engineers and to technical schools that may wish to adopt it for class room purposes.

Duplex Houses of the Back Plastered Type in Process of Construction.

Modern Cement Stucco Houses

The duplex dwellings illustrated on this page were designed and erected by The General Fireproofing Company, Youngstown, O., for its employees. Cement stucco on Herringbone lath which is attached directly to the exterior face of the studding forms the entire exterior walls. Sheathing is omitted and the lath is back-plastered between studs with cement plaster.

Before interior lathing is started heavy building paper is placed over inside of studding on exterior walls.

Metal lath is then applied to the interior areas directly over the paper and is plastered with plaster suitable for interior work.

Fire stops are placed in walls and the studding braced carefully between floors to prevent vibration. All floors are of wood on joists spaced 16 inches on centers.

This construction is economical, durable, fire-resisting and sanitary. Repair bills are practically eliminated, painting is required on exterior trim only and the general upkeep expense is reduced to a minimum.

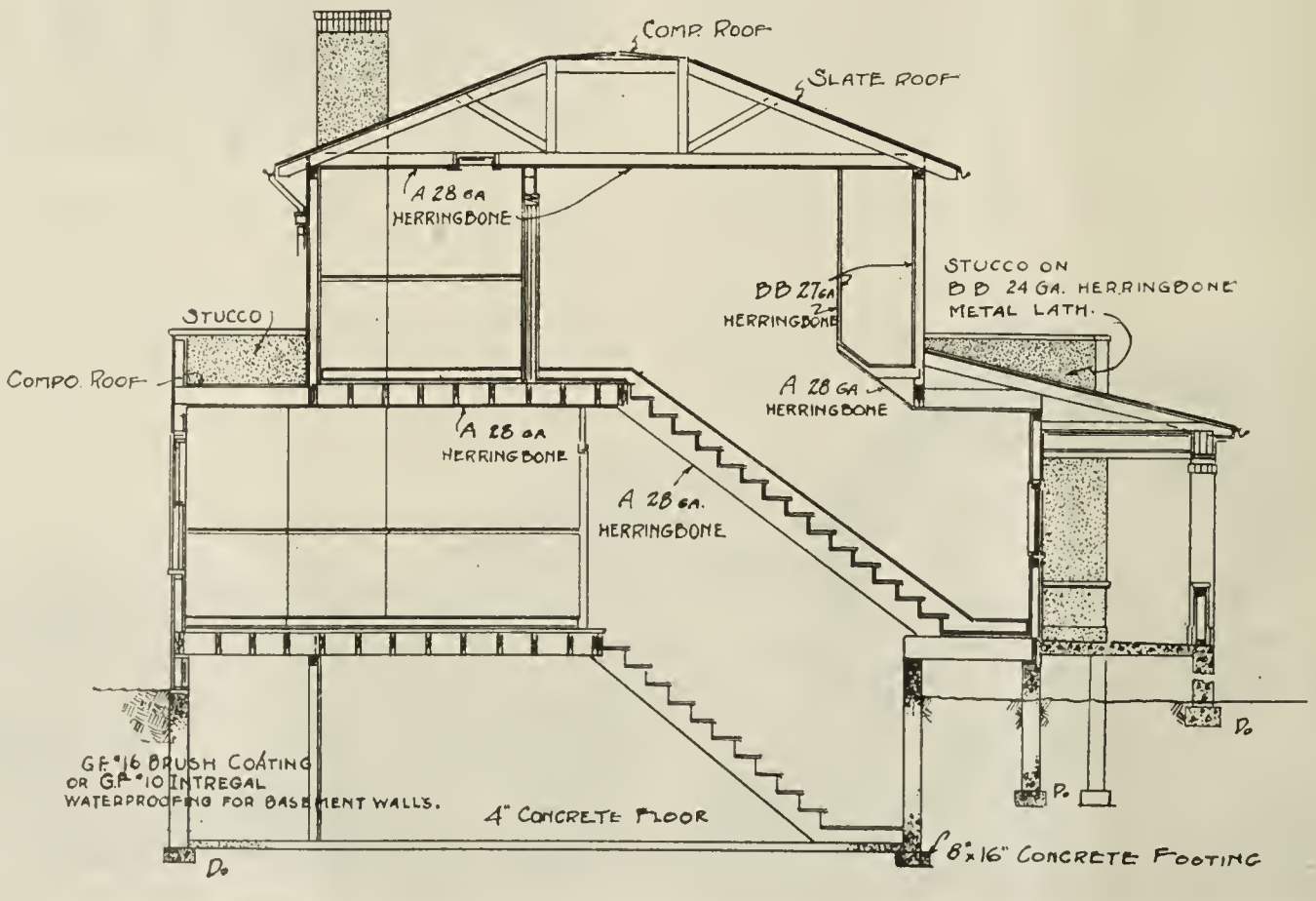
The dwelling is easily heated, and is warm and comfortable during the severe winter weather and cool and pleasant in summer. This type of construction in single or duplex houses is suitable for all locations. The materials are quickly obtainable and the cost is approximately that of good frame construction, which is more expensive to maintain, more hazardous and less sanitary.

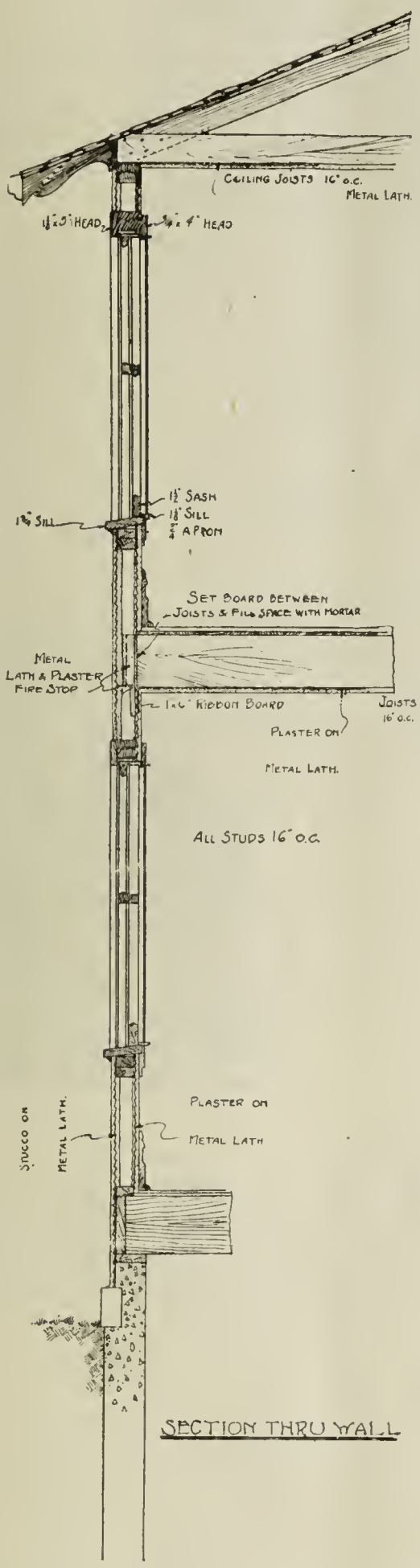
Typical Duplex Houses.

Stucco Houses Erected in Oak Park, Kansas City. Herringbone Metal Lath Used.

Two Family Stucco House Erected at Youngstown, Ohio

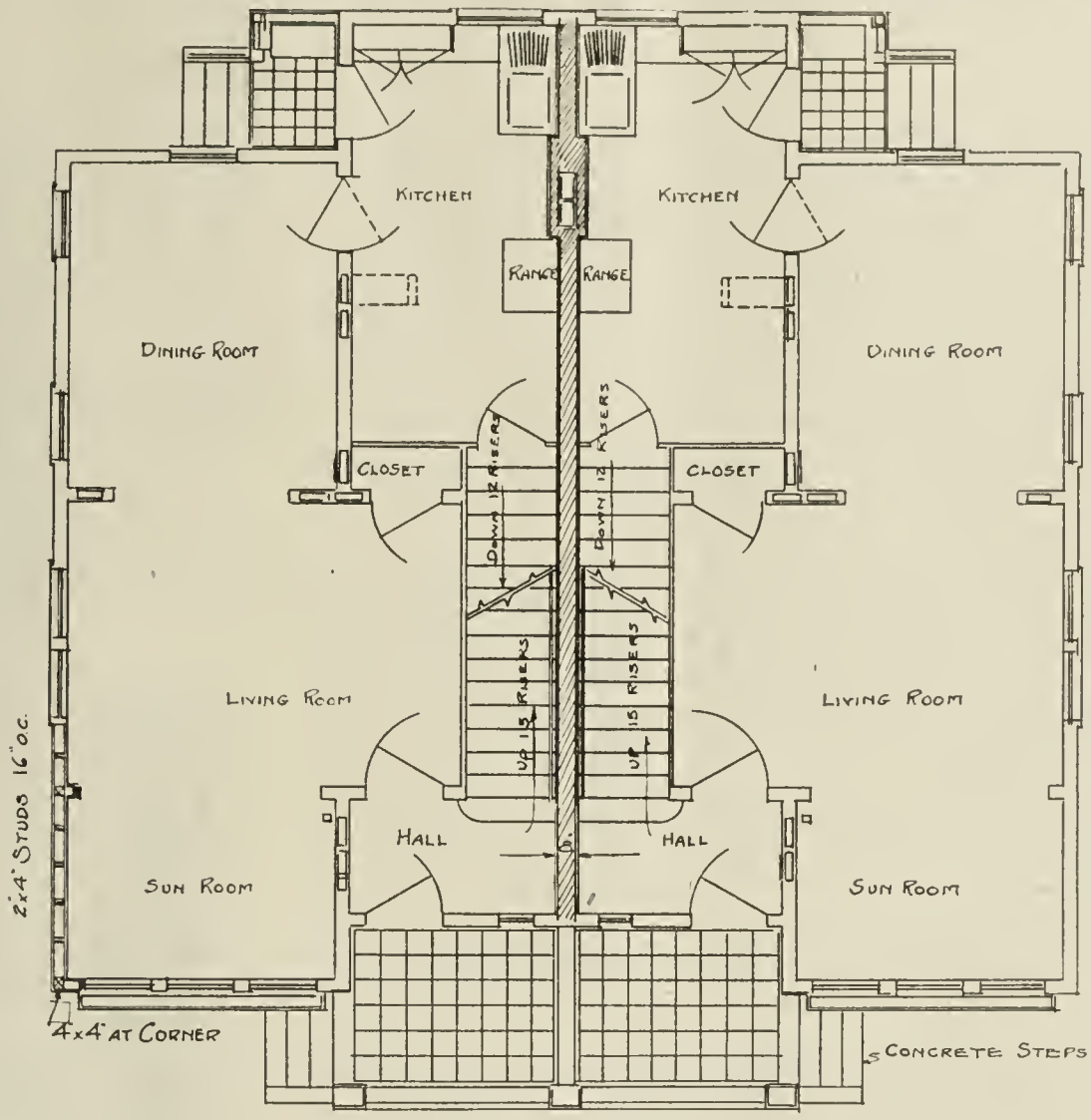
Front Elevation



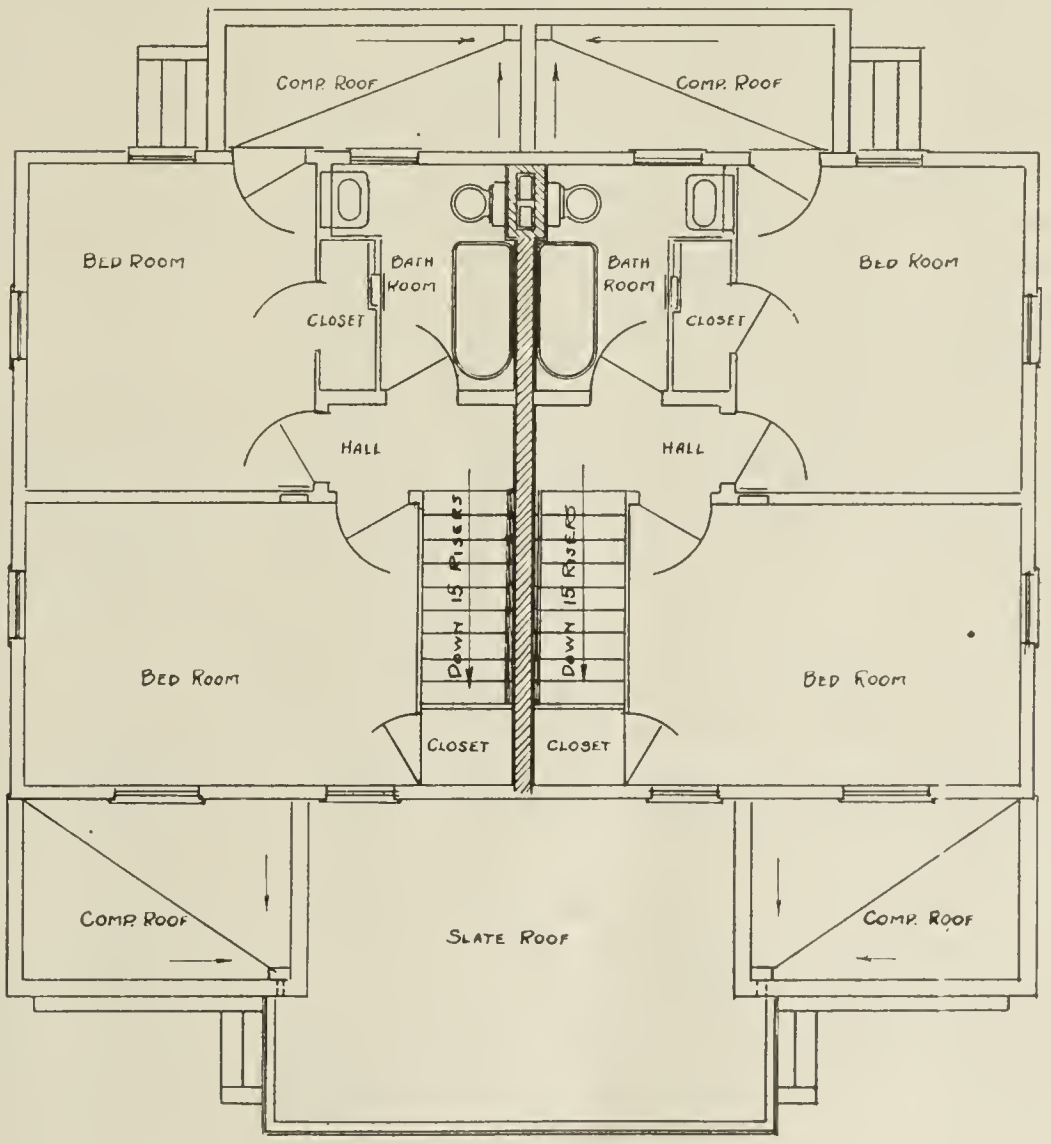


SECTION THRU WALL

Two Family House, Youngstown, Ohio.



First Floor Plan



Second Floor Plan

Proper Treatment of Transmission Belts

BY E. J. BLACK*

Transmission belts, like delicate machinery, must be given proper care if the user expects them to give good service. This is such a self-evident truism that it would seem hardly worth repeating and yet it is overlooked repeatedly. Belts which should be good for years of continued service are subjected to abuses which soon render them useless, and in many cases the manufacturer is blamed for having put out a defective product when in reality the belt was faultless.

Unjustified claims for adjustments on injured belts are made frequently by disgruntled users. Every manufacturer can cite dozens of cases.

Recently the Diamond Rubber Company was asked to make an adjustment on a belt which had been torn along the length of the belt for several yards at either end. The user was vehement in his claims that the belt was defective but when an examination of the belt was made it was clearly shown that the only cause for the injury was improper lacing. The holes for the lacing had been punched haphazardly and with no regard for providing an even strain on the belt. The result was that when it was put in use it ripped apart, and the belt was practically ruined.

Improper lacing is probably the most common mistake which users make and yet it is the one which causes the most serious trouble, often completely nullifying all the knowledge and skill which the manufacturer used in making it. There is no excuse for ruining a good belt in this way. By observing the following simple rules the belt will give the best service of which it is capable.

(1) Cut the ends of the belt absolutely square. Do not depend upon your eye or use an ordinary ruler. If the end is slanted in the least degree the pull will come all upon one side of the belt and the consequences are likely to be disasterous.

(2) Make the holes as small as practicable. Use an awl rather than a punch, whenever possible.

(3) Leave a sufficient margin at the edge of the belt without holes so as to not impair its strength. In belts two inches wide to 6 inches, the holes should not be nearer to the edge than ½-inch, in belts 6 inches to 12 inches wide not narrower than ⅝-inch, and belts 12 inches to 18 inches wide not narrower than ¾-inch.

(4) Make two rows of holes, in parallel lines straight across the width of the belt, and stagger the holes, so that the strain comes upon different portions of the belt.

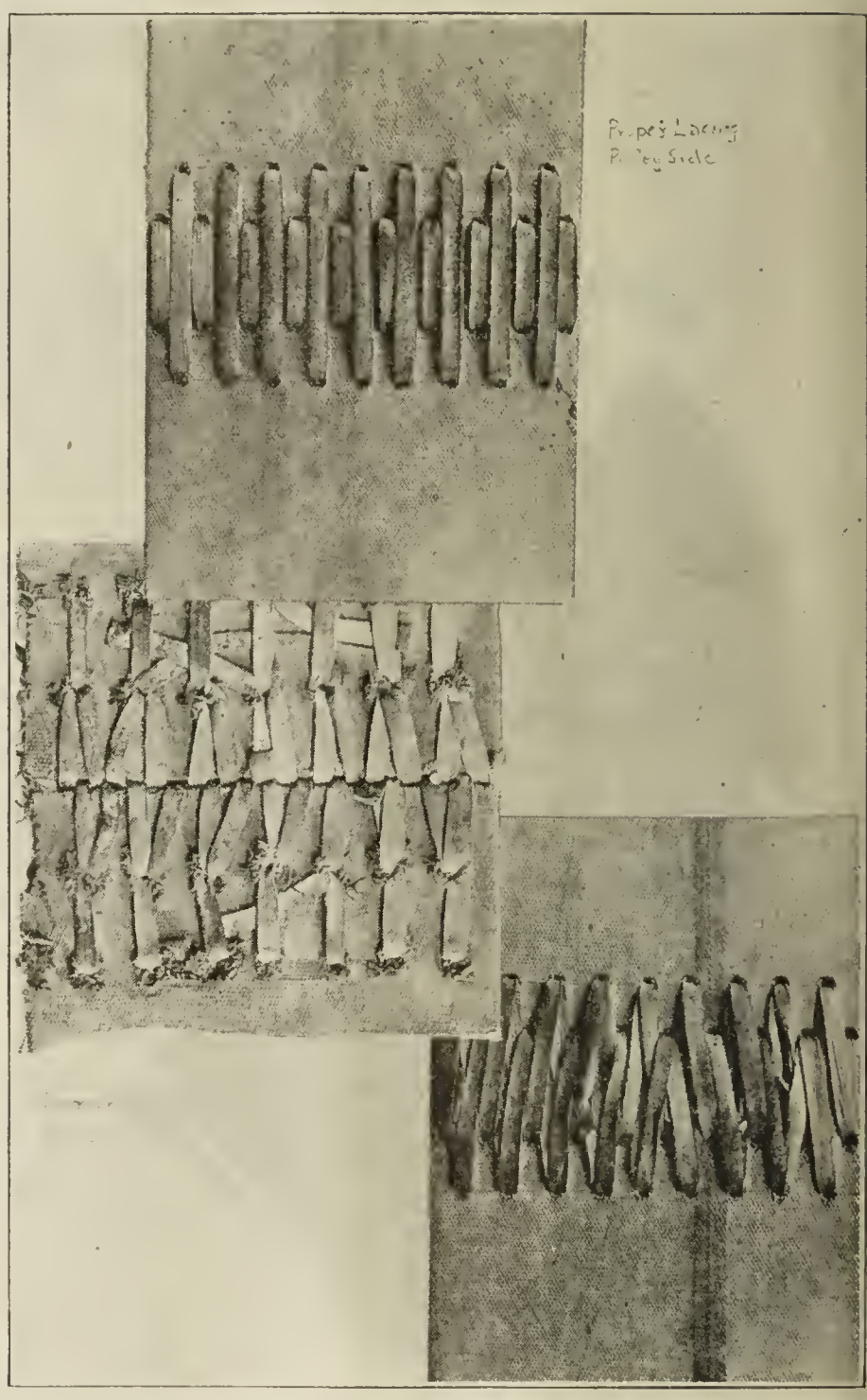
(5) Be sure that the holes in the two ends to be joined match exactly. Otherwise there will be a "jog" in the belt, and this is likely to result in tearing the belt lengthwise.

(6) Use flexible lacing, being careful to have it proportionate to the size of the belt. A heavy lacing is likely to cause trouble.

(7) In lacing the belt, make the pulley side as smooth as possible. Rough places and ends should be turned away from the pulley.

(8) In using metal fasteners select those which place the strain on the lengthwise strands of the belt. The crosswise strands are not as strong as those which run lengthwise.

Besides improper lacing, there are many other abuses which cut down the life of belts. Shafting that is out of line may cause an undue strain upon the belt and make it run off the pulley. Oil may be allowed to drip upon the belt and ruin it. The belt may be



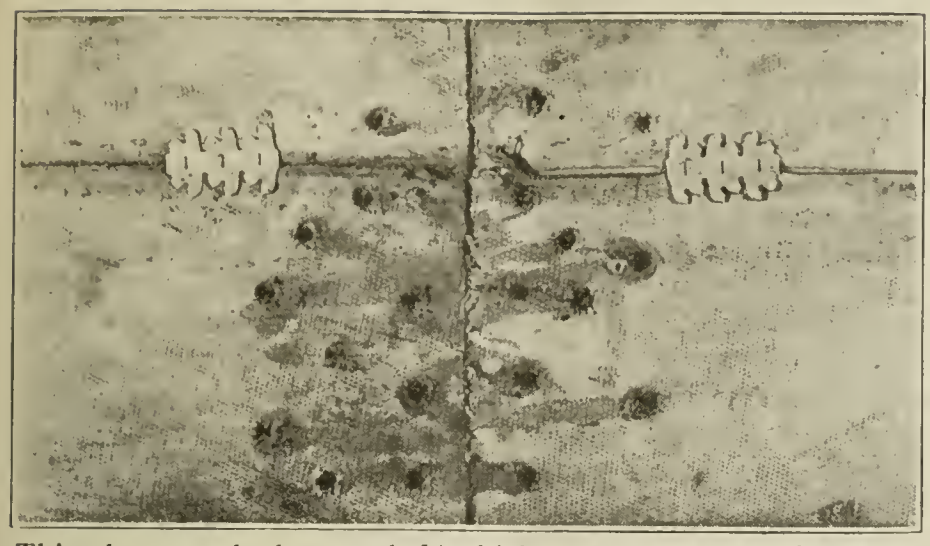
The right and wrong way of lacing belts are shown in this photograph. The top and bottom views shows a belt which has been properly laced. The holes were punched evenly and the lacing was done smoothly, leaving no loose ends which might catch and injure the belt. The middle view shows a belt improperly laced. The holes were punched in some instances so close together that the lacings tore through. A belt laced like this connot be expected to give the maximum amount of service.

applied with an initial tension so great as to produce an unnecessary strain.

Many complaints regarding unsatisfactory belt performance can be traced to the fact that the wrong belt was used on the job. No matter how good a belt is or how good treatment it receives it will fail to give satisfactory service if not adapted for the use to which it is put.

In deciding upon the right belt for any particular installation there are eight factors to be considered: (1) Distance between pulley centers; (2) diameter of the pulleys: (3) width of the pulleys; (4) use of idlers, cone pulleys, quarter turn, half turn, etc.; (5) speed; (6) horse power to be transmitted; (7) load jerky or constant, and (8) conditions such as contact with moisture, oil, or other deterioriating influences.

Over these factors the belt man usually has little or no control. His problem is to take the conditions as



This photograph shows a belt which was returned to the manufacturer by the user. It was torn along the length for several yards at either end and the user asked the manufacturer for an adjustment, asserting that the belt was defective. An examination showed that the only cause for the injury was improper lacing. The holes were punched haphazardly and when the belt was put in use the strain upon it was divided so unevenly that it ripped.

he finds them, and apply a belt that will give the best service possible under the circumstances. Yet he may sometimes perform a real service by calling attention to a faulty arrangement, when the conditions are such that the fault may be corrected. Real economies may sometimes be effected by lengthening the distance between pulley centers, increasing the width of the pulley face, or by changing the arrangement of a vertical belt so as to give a certain degree of slant.

The factors which are under the belt man's control are these:

(1) The kind of belting to be used—such as rubber, leather, canvas, etc.; (2) The grade—whether cheap, medium or high grade, and (3) the weight of the belt, such as 4 or 6 ply, single or double.

In determining the kind of belting to be used, the merits of rubber belting should receive full consideration. It is economical in first cost, extremely efficient in service, and frequently outlasts other constructions. On the other hand, in places where constant contact with oil is unavoidable, a rubber belt will not give good service. The constant use of shifters is also injurious to a rubber belt.

In deciding upon the right grade for a particular installation, the points to be especially considered are the size of the pulleys, the presence of idlers or other unusual conditions, and the speed. Small pulleys, operated at high speed, necessitate a high quality belt. The reason for this is the internal wear between the various plies of fabric, and even between the fibers in each ply, as the belt rounds the pulleys. A high grade rubber friction is the best possible protection against this internal wear, because it protects each fiber with

TABLE FOR FINDING THE HORSEPOWER OF A BELT

Speed in feet per minute.

Width	Ply	200	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
4"	4	1.45	3.64	7.27	10.9	14.5	18.2	21.8	25.4	29.0	32.7	36.4	40.0	43.6
	5	1.82	4.55	9.1	13.6	18.2	22.7	27.3	31.8	36.4	40.9	45.4	50.0	54.6
	6	2.18	5.45	10.9	16.4	21.8	27.3	32.8	38.2	43.6	49.0	54.5	60.00	65.5
5"	4	1.82	4.55	9.1	13.6	18.2	22.7	27.3	31.8	36.4	40.9	45.4	50.0	54.6
	5	2.27	5.68	11.4	17.1	22.8	28.4	34.1	39.8	45.5	51.1	56.8	62.5	68.2
	6	2.73	6.83	13.6	20.5	27.2	34.1	41.0	47.8	54.5	61.4	68.2	75.0	81.8
6"	4	2.18	5.45	10.9	16.4	21.8	27.3	32.8	38.2	43.6	49.0	54.5	60.0	65.5
	5	2.73	6.83	13.6	20.5	27.2	34.1	41.0	47.8	54.5	61.4	68.2	75.0	81.8
	6	3.28	8.18	16.4	24.6	32.8	40.9	49.1	57.3	65.5	73.7	81.8	90.0	98.2
8"	4	2.91	7.27	14.5	21.8	29.1	36.4	43.7	51.0	58.2	65.5	72.7	80.0	87.3
	5	3.64	9.1	18.2	27.3	36.4	45.5	54.6	63.6	72.7	81.9	91.0	100.0	109.2
	6	4.37	10.9	21.8	32.7	43.6	54.5	65.5	76.4	87.3	98.3	109.0	120.0	131.0
10"	4	3.64	9.1	18.2	27.3	36.4	45.5	54.6	63.6	72.7	81.9	91.0	100.0	109.2
	5	4.55	11.4	22.7	34.2	45.5	56.9	68.3	79.5	91.0	102.2	114.0	125.0	136.4
	6	5.46	13.65	27.3	40.9	54.5	68.2	81.8	95.5	109.0	122.6	136.4	150.0	163.6
12"	5	5.46	3.65	27.3	40.9	54.5	68.2	81.8	95.5	109.0	122.6	136.4	150.0	163.6
	6	6.55	16.3	32.7	49.1	65.5	81.7	98.2	114.4	130.9	147.0	163.5	180.0	196.0
14"	5	6.36	15.9	31.8	47.7	63.6	79.5	95.5	111.4	127.2	143.0	159.0	175.0	191.0
	6	7.64	19.1	38.2	57.3	76.4	95.5	114.6	133.8	152.8	172.0	191.0	210.0	229.2
16"	6	8.73	21.8	43.6	65.5	87.3	109.0	131.0	152.7	174.6	196.5	218.0	240.0	262.0
	8	11.63	29.1	58.2	87.3	116.3	145.3	174.6	203.5	232.6	262.0	290.6	320.0	349.2
18"	6	9.82	24.5	49.1	73.7	98.2	122.8	147.4	171.8	196.4	221.0	245.6	270.0	294.8
	8	13.09	32.7	65.4	98.3	130.9	163.4	196.6	229.0	261.8	294.0	326.8	370.0	393.2
20"	6	10.9	27.3	54.5	81.8	109.0	136.5	163.6	191.0	218.0	245.6	273.0	300.0	327.2
	8	14.5	36.4	72.7	109.0	145.5	181.9	218.0	254.5	291.0	327.7	363.8	400.0	436.0
24"	6	13.09	32.7	65.4	98.3	130.9	163.4	196.6	229.0	261.8	294.0	326.8	370.0	393.2
	8	17.4	43.6	87.2	130.8	174.4	218.0	261.6	305.0	348.8	392.0	436.0	480.0	523.2
30"	6	16.3	40.8	81.6	122.4	163.2	204.3	245.0	286.0	326.4	368.0	408.6	450.0	490.0
	8	21.8	54.6	109.0	163.8	218.0	272.8	327.6	382.0	436.0	492.0	545.6	600.0	655.0
30"	10	27.3	68.2	136.4	204.6	273.0	341.0	409.2	477.4	546.0	614.0	682.0	750.0	818.4
36"	8	26.2	65.5	131.0	196.5	262.0	327.5	393.0	458.0	524.0	589.0	655.0	720.0	786.0
	10	32.7	81.8	163.6	245.4	327.2	409.0	490.8	573.0	654.4	737.0	818.0	900.0	981.6
42"	8	30.5	76.4	152.7	229.2	305.4	382.0	458.4	535.0	610.8	687.0	764.0	840.0	916.8
	10	38.2	95.5	190.9	286.5	382.0	478.0	573.0	668.0	764.0	860.0	956.0	1050.0	1146.0
48"	8	34.9	87.3	174.5	261.9	349.0	437.0	523.8	612.0	698.0	786.0	874.0	960.0	1047.6
	10	43.6	109.0	218.0	327.0	436.0	546.0	654.0	764.0	872.0	982.0	1092.0	1200.0	1308.0

an elastic coating which remains uninjured and which indeed retains its life and elasticity longer when in use than when lying idle.

In this connection, it should never be forgotten that the value of a particular rubber friction cannot be determined merely by the test showing "pound pull." If the plies were fastened together with glue, this test would show a very high grade belt, but we all know that such a belt could not give service.

The most valuable property of rubber friction is that intangible quality called "life." There is no known test for this but length of service.

In specifying the proper ply for the installation, the determining factors are the size of the pulleys, width of the belt, speed, and the horse power to be delivered. The belt itself should be at least 1 inch less in width than the face of the pulley. With this in mind, the proper ply can be determined by consulting the table of horsepower and plies given on this page. To illustrate: If you have a pulley whose face is 13 inches wide, operated at a speed of 4,000 feet per minute, with a maximum load of 100 h. p., you will find by referring to the table that a 12 inch 5-ply belt operating at 4,000 ft. per minute will transmit 109 h. p. and you will specify accordingly. In specifying the ply it must also be remembered that the greatest number of plies to be used on a 12 inch pulley is 4, on an 18 inch pulley 5 plies, on a 30 inch pulley 6 plies, 40 inch, 7 plies and 48 inch, 8 plies.

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*Of the Diamond Rubber Co., Akron, O.

Plant of the Star Sand Company, Portland, Oregon

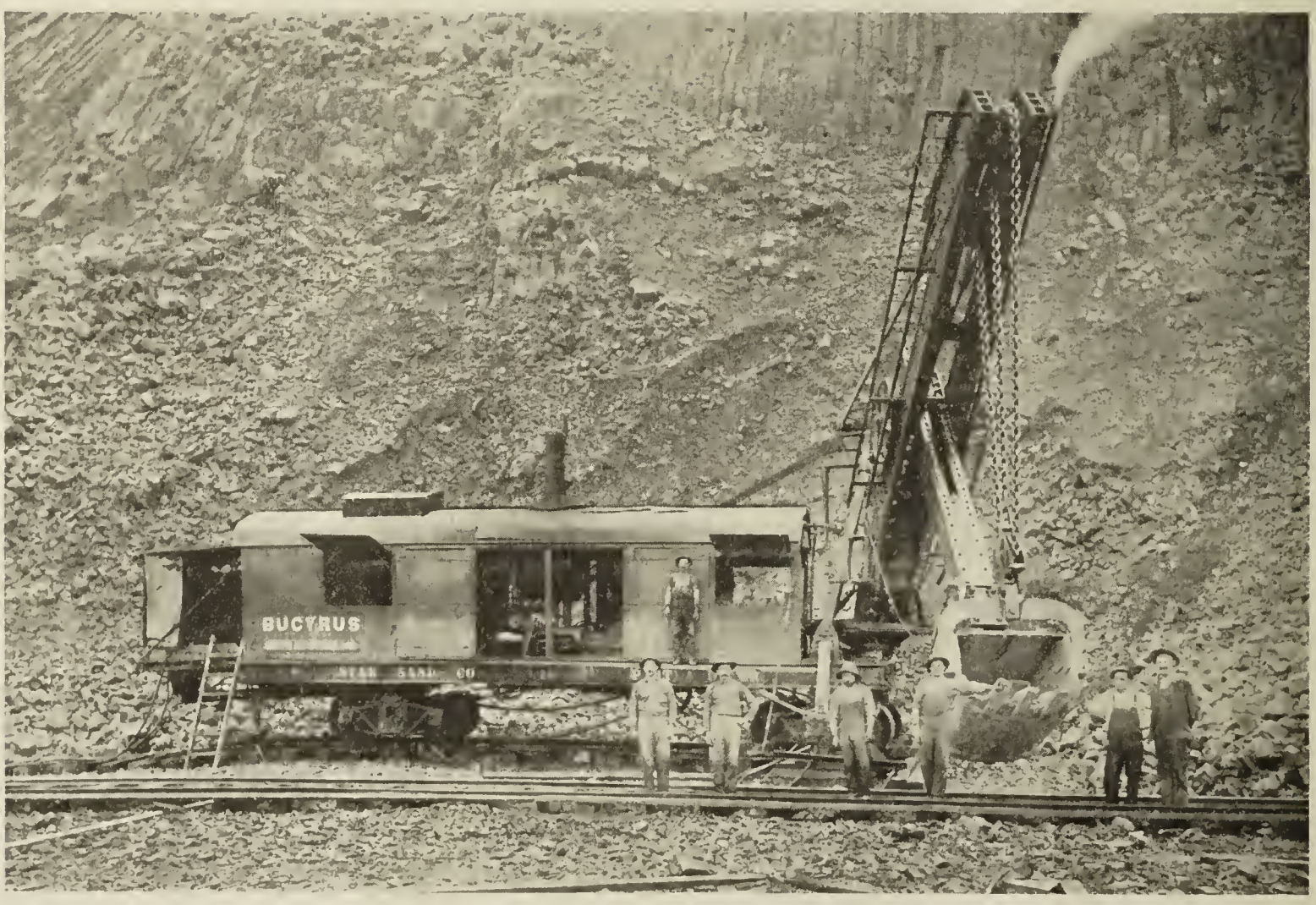
Method of Quarrying Hard Basalt Rock by Steam Shovel

The Star Sand Company of Portland, Oregon, have in many respects ideal conditions of quarrying and marketing crushed rock and rip rap.

Their quarry is situated on the Columbia River, 60 miles from Portland, thus affording excellent means of water transportation. As may be seen from our views, the rock is delivered directly from the bins into the scows, which are towed to their Portland docks.

The quarry is known as Mt. Coffin Quarry, the name being derived from the fact that in the days before our hardy forefathers blazed their way into this part of the world, the Indians were accustomed to use this small rock mountain as the last resting place for their dead. The custom was to lay the bodies on the high rock overlooking that broad river which the white men came in later days to call the Columbia.

Whether the excellent quality of the rock which these white men now quarry here, is due in any way to the bones of the Indians that were deposited thereon in ages past, we are not advised. However, this may be, this rock has taken through the ages a very interesting stratification, which may be noted from one of our views. It consists of a very hard basalt dark in color, weighing 186½ lbs. per cubic foot. It lies in a peculiar vertical stratification.



View of the face of the Star Sand Co.'s Quarry, showing the peculiar strata of the Basalt Rock—A 70-C Bucyrus shovel is used for digging this material

Quarrying the Rock

The procedure followed in quarrying this rock may be briefly described as follows:

The first step is to blast out a small tunnel about 75 feet deep with two wings at its head, 30 feet long, making a shape of a T. These wings or chambers are loaded with about 500 kegs of black powder and the tunnel back-filled with rock and earth. The blast from this charge usually produces from 150,000 to 200,000 cubic yards of loose rock. This rock is then

handled by a 70-C Bucyrus shovel, equipped with a 2½-yard dipper. The material is loaded into side dump cars, which are hauled by means of a cable to the crushers.

The 70-C shovel picks out the larger sized pieces leaving the "fines." An 18-B Bucyrus revolving shovel equipped with a ⅞-yard dipper has been purchased recently for picking up these "fines" behind the larger shovel, the intention being to run this through a smaller crusher and market it for concrete work, etc.

This shovel is mounted on caterpillar traction to give it greater mobility and facilitate moving from one part of the pit to the other to clean up.

The Crushing and Screening Plant

The rock is dumped into one No. 7½ and two No. 5 Austin gyratory crushers, from which it is elevated by three 2,300-ft. conveyors into a pair of revolving screens, 75 ft. in length. Here it is separated into three sizes and fed into the bins which have a capacity of about 800 cu. yds of crushed material each. From the bins the rock is dumped directly into scows as mentioned before, and towed to the Company's Portland docks.

About 45 men are employed in the quarry.

The plant is up-to-date in every respect and is an excellent example of a modern quarry installation.

The product is mainly crushed rock and rip rap. The former being used extensively for macadam, concrete and other hard surface roads and for general building requirements in Portland, Vancouver, Kelso, Washington and other points along the Columbia and Willamette Rivers.

The rip rap is unloaded from the cars by the derrick shown in one view and dumped on scows along side the docks.

The Star Sand Company are just completing a $20,000 cubic yard rip rap order for the United States Government for dike and jetty construction along the Columbia River.

We are indebted to Mr. C. Minsinger, President of the Company, for the above information, who was the founder of the Star Sand Company of Pittsburgh, now the Iron City Sand Company of that city. [From "The Excavating Engineer," June, 1920.]

Return Empty Cement Sacks at Once

Cement manufacturers are writing and steadily urging all dealers to return empty cement bags to our mills by earliest freight. The reason is that cement sacks are again a scarcity. The tremendous demand for cement is causing unprecedented use of the cement sack and there is a scarcity of cotton for the making of them, consequently every cement manufacturer is being hampered in his efforts to give service to the dealer and the dealer's customer.

Another view of the Mt. Coffin Quarry showing Bucyrus Steam Shovel in foreground. The derrick here shown is used for loading rip rap into scows.

General View of Quarry and Plant of the Star Sand Co., Mt. Coffin Quarry on the Columbia River, Near Portland, Oregon.

Great Western Cement Company Modernizes Its Plant

Enlargement and improvements are being made in all departments of the cement mill of the Great Western Portland Cement Co., Mildred, Kansas. A large amount of money is being expended in increasing its output and making it one of the most modern wet process plants in that part of the country.

Steam shovel quarry operations will replace former hand method of loading stone; a 60x48-inch jaw crusher has been installed for the main breaker; some wet process kominuters are being added, and with the addition of the three recently complete reinforced concrete slurry tanks, the storage of slurry will be sufficient for several days' run. Two of the storage tanks have a 2,000-barrel capacity and the third has a 1,000-barrel capacity.

By changing the lengths of the kilns from 125 to 160 feet the clinker burning capacity will be increased and also the longer kilns will give better economy

Great Western Cement Plant.

than shorter ones for a wet process. A set of electrically-driven slurry pumps are being installed to aid in pumping the slurry into the new storage tanks. The capacity of the finishing end, including the packing house and loading facilities, will also be increased.

The raw materials used in this process are limestone and clay, which are obtained from the same quarry. The face of the quarry shows a very heavy layer of limestone and a well-proportioned strip of clay overburdens, which material, as stated before, is used in the manufacture of cement. The clay is first removed and sent to a disintegrating mill, know as a wash mill, where it is prepared for mix with the limestone. The rock is quarried anad handled by a steam shovel and loaded into standard-gauge equipment and sent directly to the larger jaw crusher. Under this arrangement the company has dispensed with the very common practice in this district of elevating the material by means of expensive hoists and trestles. From the jaw crusher the material is elevated to a rock storage bin of fifteen days' capacity.

The mix is handled by automatic devices. The rock from the storage bin is conveyed by belt conveyors to an elevator, where it is discharged into a storage tank above the kominuter. The clay is pumped by electrically-driven pumps to the tube mills, where the limestone and shale is mixed. The slurry is first conveyed to small correcting tanks, where it is tested. To insure that the slurry burned will be uniform the slurry from the small tanks is then pumped into a large mixing tank. From the mixing tank it is then conveyed by means of pumps into the storage tanks. Mechanical agitators throughout mix the slurry and keep it a uniform product.

The feed to the kilns is the F. L. Smith & Co. improved automatic feed device. The kilns are at present 8x125 feet, but will be increased in length to 160 feet. Coal is used for burning.

During the present reconstruction the kiln hoods are being so changed that any air drawn into the kiln by natural draft will have to come up over the hot clinker as it falls from the kiln into the pit below. This will be accomplished by lengthening the sides of the hood so that the end of the kiln will be covered and it will be easier for air to come in at the bottom than around the sides and top.

Water is added to the clinker as it enters a rotary cooler. The cooler is mounted below and to one side of the kilns so that it is not necessary to elevate the hot clinker. Ordinarily the clinker goes direct to the finishing end of the mill but may be sent to a clinker reserve. The kominuters and one large tube mill are used in the finishing plant and the finished product is sent to the packing house storage, where it is possible to hold 60,000 barrels of cement.

CONCRETE ROAD MOST ECONOMICAL

From all available data, there is no doubt that at the end of 8 or 10 years of service, depending upon the amount of traffic, the concrete pavement is the most economical one that can be constructed.

These are but some of the reasons why I advocate a more permanent road than we have been building in the past, and it is now my belief that, considering the new problems of traffic that we have to solve, the most practical pavement for a highway today is the one built of concrete.—Frederick Stuart Green, N. Y. State Commissioner of Highways.

How Do You Figure Contracts?

Factors Every Contractor Should Consider In Estimating

By D. S. Colburn, Formerly with the Fabry Construction Company, Green Bay, Wisconsin

Editorial Note:—The information given in this article should be considered by the contractor as a warning. After you have made up a complete estimate for a job, look for the forgotten items. Revise the estimate after including all of the items mentioned in this article. Your estimate may be high, but you can rest assured that it is correct. Bear in mind that it is good business for you to allow the "forgetful" contractor to underbid you.

Last summer a contractor who has had 35 years of experience, and always enjoyed a reputation for good, honest work and who was well thought of in his community, secured a $50,000 job. But he couldn't get a Surety Company to go his bond. It was necessary for him to go among his friends and obtain the required amount of personal endorsers. Surely a man who has been in the business so long and who has done good work should not be in such a position, but should be so situated financially that he would have no difficulty in obtaining bond for at least this amount from a reliable Surety Company. There must be some explanation for such a condition. And there was, because after this job was completed he admitted that he had spent $2,800 more than he had figured on. This instance, together with others which have occurred, show that this man's main difficulty lies in his estimating.

I know another contractor who started in business about three years ago. He is working on a cost-plus plan. Today he is well situated financially and owns considerable property. He is thoroughly reliable and honest. Starting with only a small job his work has increased enormously and today he has more jobs in view than he can handle. He is sure of a definite profit on his work, based on the cost of the job.

The average contractor forgets a great many things which should be included in making up his esimate. It is true that many of these items are small and it might seem that they are insignificant, but when several are taken together, the cost increases rapidly. It is probable that on an average about 6 per cent of the cost of the job is not taken into consideration when the estimate is made. The accompanying table illustrates this point.

It frequently happens that the general specifications are glanced over in a superficial manner, the contractor immediately taking the plans and specific specifications and estimating all materials and workmanship. When the materials and labor have been figured from these, 99 per cent of the contractors think that nothing remains to be done except add the usual 10 per cent for profit. The trouble is that the general specifications are not carefully enough observed and studied.

As an example of this, there was a large contracting concern recently figuring on a drainage job of considerable magnitude. A close study of the specifications revealed the fact that the contractor was responsible in many ways which ordinarily would not involve any responsibility on his part. For instance, he had to guarantee the designer's work and if this job was done according to the plans and specifications, and it didn't work, then the contractor would receive no payment for the job. This happens in many cases.

In another instance, the specifications made the contractor responsible for the work under the specifications and plans as stated. In other words, the plans were prepared by the architect but the contractor was held responsible. One part of the specifications referred to a basement floor and stated that the contractor should guarantee the basement floor slab to stand a certain head of water. The slab has failed and it is a question now who is responsible.

There are certain matters that are commonly overlooked in estimating and these may be briefly summarized as follows:

(1) Surety Bond—A surety bond guarantees the faithful performance of the contract and payment of all bills in connection therewith. 1 per cent is the amount commonly charged for this bond no matter how big or how small the job. Many contractors pass this up and think that they can take care of it out of their 10 per cent profit. It may seem that this is rather the exception than the rule and that very few contractors would neglect to take care of this feature. It is surprising how great a number and how many of all classes of contractors neglect to take this factor into consideration.

(2) Liability Insurance—Liability insurance usually amounts to 5 per cent-8 per cent of the total labor cost. This can be figured at that amount and should always be taken into consideration.

(3) Temporary Heating—Another item scarcely, if ever, figured in is temporary heating. Heating is required not only in winter work, but also in early Spring or Fall construction. While the job may start in the summer, it should be borne in mind that it may possibly run into the winter and therefore, the problem and cost of providing temporary heating should be taken into consideration.

(4) Temporary Enclosures—These are frequently needed, especially in the case of winter work. They are often required to enclose a part of a building so as to afford public protection. Frequently in the case of a building located in the city, roofing is required above the sidewalks. Material sheds are always needed. These items are small but, of course, count up.

(5) Water for Building Use, Temporary Piping and Hoists—It should be taken into consideration that water will be required for various operations connected with the building, for instance, the mixing of concrete, in keeping the concrete wet, and in cleaning. Elevators or hoists are required for elevating the materials to the proper place. This is an item that is many times neglected. The contractor figures that it costs so much to lay so many bricks, but the means of getting them in place is not considered.

(6) Fire Insurance—During the process of construction the building is under joint ownership by the contractor and the individual or company for whom the building is being constructed and, in the event of loss of the building by fire, the loss is prorata. The fact remains that the contractor must pay the premiums on the job until finished.

(7) Engineer, Time-Keeper, Watchman—A service engineer is required in connection with the layout and other details. This expense is, however, very slight. But the expense of the time-keeper and watchmen, in case of a large job, amounts to a very appreciable figure.

(8) Telephone Service—Sometimes telephone service is not required, while there are times when it is a great necessity and this item of expense should also be considered.

(9) Traveling Expenses—This item covers the cost of transporting the foremen or other laborers sent out of town away from their homes. The contractor must as a rule pay all of the railroad fares and board for these men as well as his own expenses.

(10) Cutting & Jobbing—Cutting and jobbing for other trades is a large item since the general contractor is usually required to cut all openings for electricians, plumbers and steam fitters and to patch these up after these workmen have finished.

(11) Guarantee—Often the architects require that the contractor guarantee the material and workmanship for two years or maybe more. This is an item of considerable importance and is never taken care of under the general overhead expense. The United States Government figures 1½ per cent depreciation per year on buildings, so it is an easy matter to gain an idea of how much this item alone amounts to.

It should not be taken for granted that the general specifications are always the same, but these should be carefully studied in connection with the balance of the specifications and plans and items such as described should be taken into consideration when putting in a bid on a job.

School Building 130'0"x200'0"-3 Stories No Basement

467	yds. Rock excavation	@	$ 2.00	$ 934.00
880	yds. Earth	@	.30	240.00
9,900	cu. ft. concrete footing	@	.22	2,178.00
11,880	cu. ft. concrete walls	@	.25	2,970.00
13,524	sq. ft. reinforced concrete corridors and toilets	@	.35	4,733.40
13,524	sq. ft. terrazzo floors	@	.25	3,381.00
1,980	lineal ft, terrazzo base	@	.35	693.00
7,914	sq. ft. plain cement floors	@	.10	791.40
182,160	face brick	@	35.00	6,375.60
1,339,240	common brick	@	18.00	24,106.32
32,000	sq. ft. partition tile	@	.12	3,840.00
3,960	cu. ft. cut stone trimmings	@	1.75	6,930.00
58,000	enameled brick	@	50.00	2,900.00
16,059	yds. lath and plaster	@	.40	6,423.60
50	lineal ft. tile flue lining	@	.75	37.50
6,000	lineal ft. corner beads	@	.06	360.00
1,800	yds. metal lath	@	.45	810.00
4,725	sq. ft. slate blackboards	@	.28	1,323.00
2,160	sq. ft. cork tackboard	@	.28	604.80
27,000	lineal ft. grounds	@	.01½	405.00
96	squares steel ceilings	@	7.00	672.00
	Moving Picture Booth with vent Balcony in Gymnasium			1,896.00
66,000	ft. maple floor	@	65.00	4,290.00
500,000	ft. lumber	@	45.00	22,500.00
260	squares roofing	@	7.50	1,950.00
500	squares floor deadening	@	2.00	1,000.00
47	tons structural steel	@	115.00	5,405.00
3	iron stairs (sub-bid)			2,600.00
	hardware trim			1,700.00
	sheet metal (sub-bid)			890.00
	millwork, sash, doors, trim, etc. (sub-bid)			8,197.00
	Labor on millwork			3,278.00
	painting (sub-bid)			1,890.00
	Usual Estimate			$126,558.42
	10% Profit			12,658.54
	Usual Bid			$139,243.96

FORGOTTEN ITEMS

Bond 1%	$ 1,490.00
Fire Insurance ½% of $100,000	500.00
Liability Insurance 5% of labor $48,000	2,400.00
Telephone	160.00
Traveling Expenses, Board, Etc.	650.00
Temporary Office, Locker, Sheds, Etc.	548.00
Water for Building Uses, Temporary Piping, Hoists, Etc.	182.00
Lights, Fences, Barricades	80.00
Watchman 6 months @ $70.00	420.00
Time-Keeper	350.00
Engineer, laying-out, batter boards, etc.	30.00
Protection of erected work	100.00
Temporary Heating 6 months will burn 220 tons coal @ $7.00	1,540.00
Cleaning out building	100.00
Carting Debris	25.00
Cutting and jobbing for other trades	430.00
	$ 9,005.00

Bid Should Be:—

Usual Estimate	$126,585.42
Plus Items Overlooked	9,005.00
Correct Estimate	$135,590.42
Plus 10% Profit	$ 13,559.04
Correct Bid	$149,149.46

Sparkling Granite Facing for Concrete Work

Crown Point Spar Co., 663 Broadway, New York, N. Y., producers of scientifically milled mica spar, are distributing an interesting pamphlet entitled "Micaspar—How to Use It." The pamphlet, which is illustrated with views of concrete objects including blocks, garden ornaments, and buildings, contains much useful information of value to the producer of concrete stone. Micaspar gives to concrete a permanent sparkling granite face. Besides adding a pleasing appearance to concrete in which it is used, it produces a wearing surface much more durable than ordinary aggregate. Micaspar is so hard that it cannot be crushed in the ordinary power crusher. Because it has a two-way cleavage, it breaks into irregular but generally cubical crystals which are easily separated by screens into sizes that approach uniformity. This is an important item because the micaspar produced by the Crown Point Spar Co. is carefully screened into various sizes and then the separate sizes are recombined into an aggregate possessing a minimum amount of voids. Since the durability of concrete stone depends upon the elimination of voids, the recombined aggregate is capable of producing a synthetic stone that has unusual wearing qualities. Besides describing the details involved, in the production of micaspar, the pamphlet specifies methods of proportioning, mixing and applying finish coats to exposed concrete surfaces. One of the fundamental precepts that must be observed in producing any concrete stone is that careful workmanship is as important as first-class material. This fact is emphasized throughout the pamphlet. The instructions specifying the methods to be employed in applying and finishing surface coats are valuable to contractors and concrete products manufacturers engaged in this class of work.

News of the Cement Mills

The Petoskey Portland Cement Company, Petoskey, Mich., in order to rush work in the construction, tracks, quarries, etc., has brought in fifty-six men from Detroit and will endeavor to bring another lot of about that number, making a total of 250 men employed.

A part of the crew will be turned over to the companies who are putting up the various buildings and the remainder will be used by the company in the regular work. The men are nearly all being housed and boarded in Petoskey, going to and from work by motor truck.

The Bath Portland Cement Co., Finance Building, Philadelphia, Pa., with works at Bath, Pa., is considering plans for its proposed new plant on property recently acquired at Standt's Eddy. Preliminary estimates place the cost in excess of $1,000,000 for buildings and equipment. The company has recently increased its capital stock from $700,000 to $2,500,000.

The name of the Fort Dodge Portland Cement Corporation has been changed to the Gilmore Portland Cement Corporation. The concern has maintained an office in the First National Bank Bldg., Fort Dodge, Iowa, since it was organized and still has it, but as the mill is at Gilmore City, Iowa, they prefer that name for the company.

A local Pennsylvania railroad crew in Easton, Pa., recently made up a train of 50 cars of cement at the Alpha Cement Works, at Martin's Creek, consigned to Akron, Ohio. The cars hold 100,000 pounds each, making the total shipment 5,000,000 pounds. This is said to be the largest single shipment ever sent to one city.

The Giant Portland Cement Co., main offices at Philadelphia, Pa., and plants at Egypt and Norfolk, Va., voted to defer an improvement and enlargement program at its recent meeting of the board of directors. This program involved an expenditure of $300,000 for new machinery and equipment.

The Edison Portland Cement Co., Easton, Pa., has given its 600 employes an increase of 5 cents per hour. An official of the company expressed himself as well pleased with the outlook for the future. With the exception of a brief shut-down just prior to April 21 the company has been running full strength and full time. This temporary shut-down was due to a shortage of coal.

The cement industry in Clark county, Indiana, carried on by the Louisville Cement Company, is continuing to grow to larger proportions. The records for April showed close to 100,000 barrels of cement manufactured and shipped during the month from this plant, located ten miles north of Jeffersonville. This is equal to a trainload of twenty cars a day. The company is shipping quantities to Louisville by interurban freight, and expects to send ten carloads a day by that means shortly.

After long delay, due to inability to get certain new machinery and parts, the grinding of cement has been started at the plant of the Castalia Portland Cement Co., Castalia, Ohio.

During the past winter there has been much rebuilding and the installation of electrically-driven machinery, more than $300,000 having been expended for this purpose, making the plant modern in every respect. With W. S. Kirkpatrick in charge as general manager, he having been appointed several months ago, a big season is now anticipated.

A completely equipped cement plant located at Stockertown, Pa., daily capacity 2,000 barrels is for sale by Joseph P. Day, broker, 67 Liberty street, New York, N. Y. It has a large power plant, contains 69 acres and has large quarry, deep face.

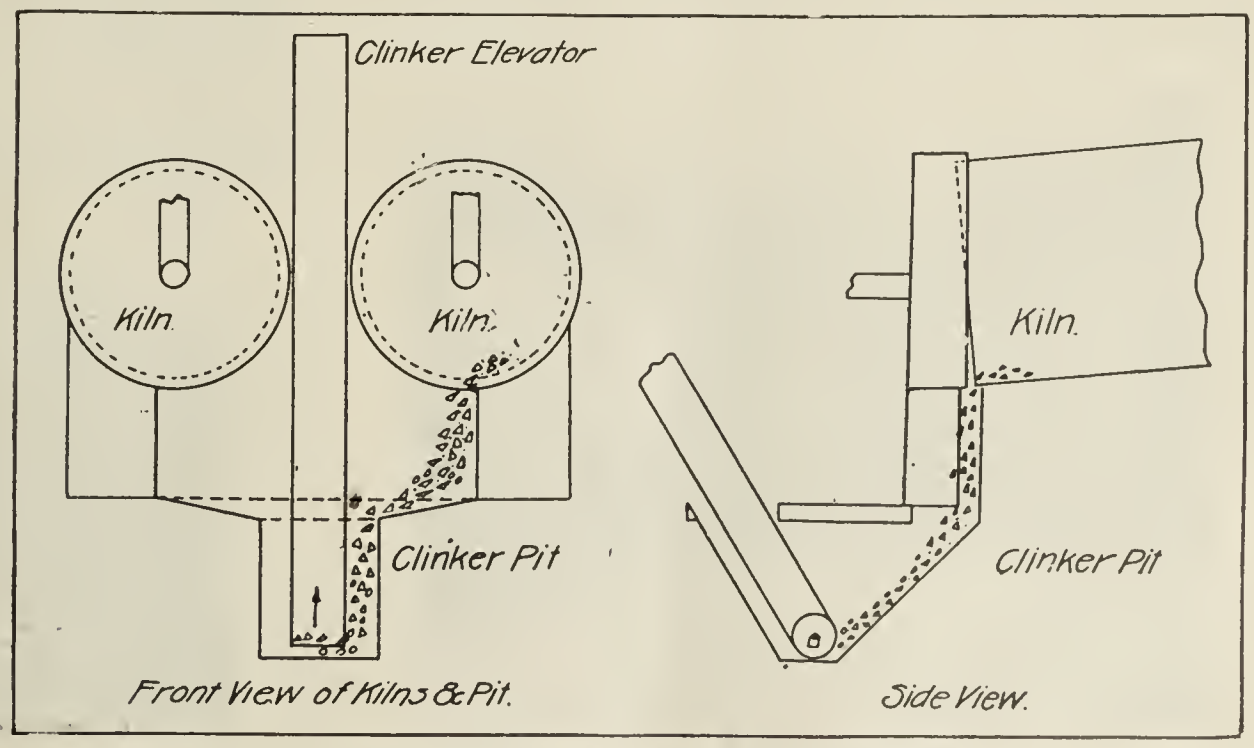
Handling Cement Clinker

The Cape Girardeau Portland Cement Co., Cape Girardeau, Mo., has devised a method of handling the hot clinker from the cement kilns to the clinker storage elevator without the use of a conveyor across the ends of the kilns.

The hot clinker falls from the ends of a pair of kilns into a pit, the bottom of which is sloped so that the material from the two kilns is directed to a single chain-bucket elevator.

It is claimed that this method is superior to the arrangement of collecting the clinker by a pan conveyor under the ends of the kilns.

The accompanying sketch shows the method used by this company. It will be readily seen that the installation cost is much less than for the usual method, and there is claimed to be a saving of the power and upkeep costs.



Clinker-handling pit and elevator arrangement

A New Type of Fireproof House Construction

G. F. Self-Centering Houses Erected in Youngstown, Ohio.

During the summer of 1918, four six-room two-story fireproof houses were constructed in Youngstown, in which self-sentering was used in the walls, partitions and floors. The photographs shown herewith illustrate some details of the construction. These houses are of hollow wall construction, consisting of two layers of 28 gauge self-sentering and plaster, separated by a 3-inch air space. The floor construction is of monolithic concrete slabs and beams. The slabs are formed and reinforced by 24 gauge self-sentering, supplemented by rod reinforcement over the tops of the beams. The beams are formed monolithic with the slabs by curving the ends of the self-sentering floor sheets to a 12-inch radius, and are reinforced with rods to span between columns.

The beams are located so they are over partitions or in exterior walls in all cases and the only indication of their location in the finished houses is the coved ceilings resulting from their formation. The columns are of concrete formed with self-sentering, reinforced with rods where required, and are concealed in the exterior walls and interior partitions. The partitions generally are 2-inch solid, plastered on self-sentering or where required to conceal heater pipes, etc., are hollow with two layers of self-sentering and plaster similar to construction of the exterior walls.

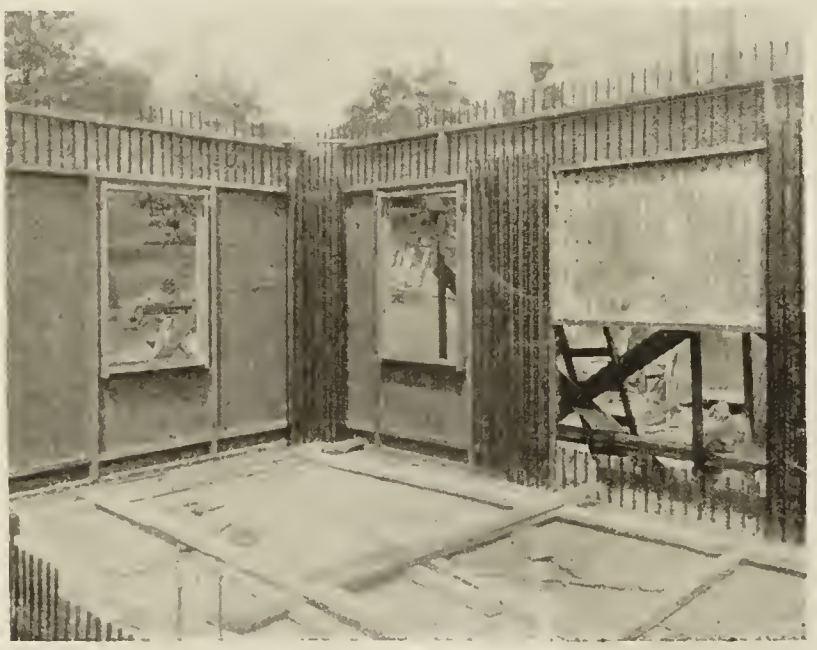
The self-sentering forming the walls was erected on a 2 x 3 frame consisting of horizontal pieces between columns at floor levels and at tops of windows with vertical pieces at sides of windows and columns. Short horizontal pieces were also used in some cases to act as a separator at mid-story height and also as a nailer for wood base. This framing contributes nothing to the permanent support of the house as it serves only as a temporary support and separator.

Photograph No. 1, shows the construction of the walls, with the exterior lath in place plastered and back plastered between columns. The horizontal 2x 3 at the head of windows form the bottom of the wall beams and serves as a nailer for the curved ends of the self-sentering floor sheets.

Photograph No. 2 shows the floor lath in place.

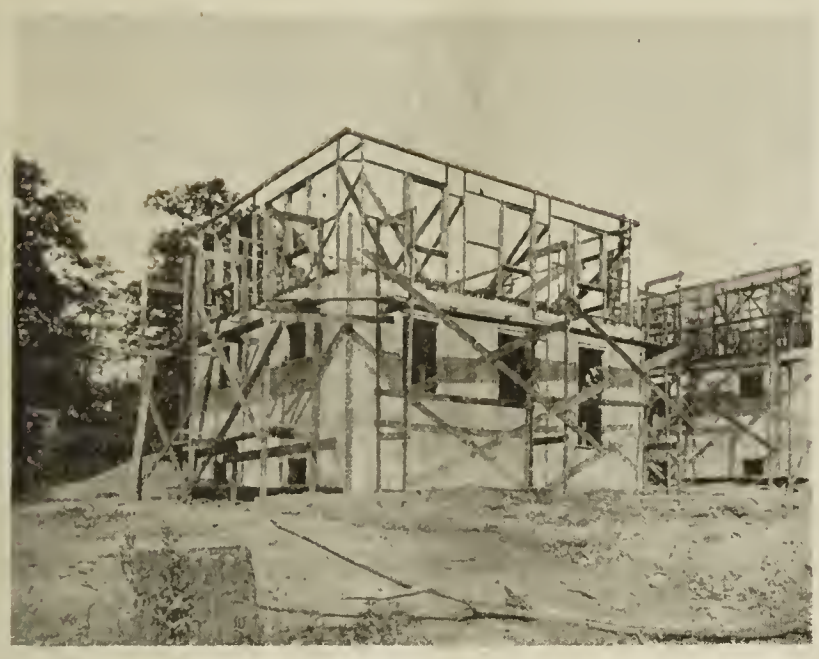
Photograph No. 3 illustrates several stages of the exterior wall construction.

The roofs of these houses were built of wood frame construction. Concrete slabs form the second story



Photograph No. 1

Photograph No. 2



Photograph No. 3

ceiling which protects the roof from any possible fire that might originate within the house, and a non-inflammable roof covering protects it from without.

The houses were finished with wood floors, wood trim, etc., the same as the usual frame house. Photograph No. 4 shows an interior of one of the finished houses. A feature of this construction that could not be clearly brought out in the photograph is the curved ceilings, obtained in the formation of the beams. This type of fireproof residence construction will be of interest because it is unique, and the cost is only 12 per cent greater than ordinary frame construction.—Published through the courtesy of General Fireproofing, a monthly magazine published and sent to architects, engineers and contractors by the General Fireproofing Co., Youngstown, Ohio.

Photograph No. 4

National Screen Separator

The National Engineering Co., 549 West Washington Blvd., Chicago, is distributing two new pamphlets describing and illustrating the Simpson intensive foundry mixer and the National screen separator. The Simpson mixer is extensively used for mixing core sand, facing sand and other foundry sand mixtures in foundries producing gray iron, steel, aluminum, malleable and brass castings. The National screen separator handles sand, cement, cement clinker, phosphate rock, Fuller's earth, clay, shale, gypsum, marble, coal, coke, sandstone, sawdust, talc, sugar, etc., etc.

New Booklet on Modern, Scientific Methods of Belt Joining

Among the recent bulletins and booklets on better belt service issued by the service department of the Crescent Belt Fastener Company, there is one publication which will be of particular interest to all readers of CEMENT AND ENGINEERING NEWS who have belts in their plants.

Both the man who buys belting today and the man who has an investment in belting have a commodity which can only be replaced with delay, difficulty and considerable expense, and the continuous performance of which is absolutely essential for maintenance of production schedules and operating at minimum low cost.

One of the biggest problems the belt user has to face is that of joining the belt in a way which preserves its strength and insures its longest and most satisfactory service.

Obviously, no belt can give better service than its joint will permit, and if destructive methods are employed which punch out valuable belting material or weaken the lengthwise, power-carrying belt fibres, the service and the life of the belt are impaired.

This new Crescent circular entitled "Modern Scientific Methods in Belt Joining" contains practical belt-joining data for the practical belt-joining man. This information is of permanent value to anyone interested in belt upkeep and it is so designed, that when opened up and tacked to a wall, it presents on one page full information for joining the belt to insure its best service under all conditions of work.

The instructions as to how to make belt joints which retain the belt's full strength and assure its longest life are given in simple and concise language and are amply illustrated. The larger illustrations show in full size the outside and pulley sides of Crescent joints. A cross section illustration shows how a belt can be joined without weakening it in any way, and is a vivid demonstration of how the Crescent method retains the full strength of the belt and actually reinforces it. It also shows how the Crescent method avoids metal coming in contact with the pulley and thereby eliminates noise, wear and crystallization.

Copies of this illustrated circular, Form N. Y. 227 will be sent to any readers of this publication to whom it may be of interest. Will they please address Cement & Engineering Service Dept. of Crescent Belt Fastener Company, 381 Fourth avenue, New York.

Arkansas City, Arkansas

Concrete Reservoir: 2,000,000 gallons capacity. Hydrated lime to be used.

The National Lime Association, Washington, D. C., will be glad to furnish detailed information regarding the way in which lime makes best construction.

The following pamphlets are now available for distribution by the Construction Department of the National Lime Association.

350—Economical Brick Mortar.
351—In the Concrete Chute.
352—Permanently Dry Basements.
353—Hydrated Lime in Concrete.
(Practical Pointers and Proper Methods)

These pamphlets are of convenient size and interesting subject-matter. Copies will be furnished on request.

News of the Concrete Products Factories

Extensive additions to the manufacturing equipment of the Cunard-Lang Concrete Company, 459 Furnace street, Columbus, Ohio, have almost doubled the capacity of this plant over that of last year. Three new steam kilns and two new power machines for making cement block have been installed and this factory is now able to turn out 2,300 blocks a day. The capacity last year was 1,200 per day.

By the old method of weather curing, three weeks were required to make concrete blocks. The steam kilns used by the Cunard-Lang Co. do the same work in one day. They cure the product by a combination of heat and moisture. By their use, cement block can be manufactured one day and delivered the next. Each block undergoes a pressure of thirty tons in manufacture.

A test of Cunard-Lang block by the Engineering department at Ohio State University showed that the absorbtion of moisture was less than in brick. A test by local building authorities showed that the block would not crush under pressure of 150,000 pounds. In this test, it stood 3,000 pounds more pressure than that successfully resisted by natural stone.

The company maintains a porch department in which cement columns, vases and other ornamental lines are featured. This department renders service to those who contemplate building, assisting in proper selections, color schemes, etc. These products are made in practically any color desired.

The present season has opened well and officials of the company expect the largest business in its history. April was the best month since business was started some years ago. The increase in the consumption of concrete block has already totalled forty per cent over last year's record. The scarcity of lumber and general high costs of building are given as the reasons

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George Ledhetter, 15 East St., Asheville, N. C., wants names and addresses of manufacturers of concrete block machines

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R. H. Bushnell, Poughkeepsie, N. Y., is distributing a circular descriptive of the carborundum tooling and surfacing machine he manufactures. This is a practical machine for concrete block manufacturers desiring to use this method of improving the surface texture of their products. As ordinarily made this machine will tool stone, blocks, or trim up to 2 ft. high, 2 ft. wide and 10 ft. long. Further information can be obtained from the manufacturer.

Republic Iron Works, Tecumseh, Mich., makes the "Monarch" block machine. A feature of this machine is its wide range of adjustment. It will make any size block from silo stones to foundation blocks. The machine is simple, strong and inexpensive. Complete information may be had from the makers.

A. D. Kennedy, Jr., Camden, S. C., wants prices on cement brick machines.

Out of a meeting of more than fifty Iowa manufacturers held last month at Hotel Savery, Des Moines, Iowa, was born the Iowa Concrete Products Manufacturers' association, which will affiliate with the international association, as soon as arrangements can be made.

The meeting the first day was merely preliminary, to determine whether Iowa manufacturers desired to form the association. The proposition was enthusiastically received and the meeting was continued the next day, when state officers will be elected and delegates to the international convention named.

Wallace R. Harris, chairman of the executive international committee, acted as chairman and set forth the advantages of such a union in a short address. A. J. Curtis, manager of the cement bureau of the Portland Cement association, Conway Bldg., Chicago, was among those who talked. He strongly advocated the proposed Iowa chapter. Other speakers included Mr. I. T. Steele, sales manager of the Granette Products Co., Des Moines, Iowa.

A committee was named to report on a constitution and by-laws.

Ephriam Johnson, Eveleth, Minn., has formed a partnership with Albert Bergstedt, formerly of Duluth, in manufacturing concrete building blocks and brick. The plant will be located at Spruce Junction, two and one-half miles south of Eveleth, where Mr. Johnson owns a big gravel and sand pit. Work has been started in the pit and some machinery is now on the road. Two of the best types of blocks now on the market have been selected. The wet or poured concrete will be used.

The Nelson Concrete Culvert Company of Ohio, was incorporated in Ohio for the sum of $60,000 with R. T. Lewis, George B. Knapp, Fred E. Guthery, C. Erickson, and A. J. Bane of Pontiac, Ill., as incorporators. It was announced that the company, which will be located on the Erie railway right of way at Barnhart street, Marion, Ohio, will be in operation within thirty days.

Several large buildings will be erected by September, but it is expected that work will continue during the summer in the open. A carload of equipment arrived this morning and will be erected immediately.

The company, which has a chain of plants in several states, has headquarters at Pontiac, Ill.

The "Master" combination brick and block machine made by the United Mfg. Co., Belmond, Iowa, makes wet process water-proof cement brick or blocks in most any size and color. A few seconds is required to adjust machine for making any desired size of brick or blocks. The operating speed, the ease of handling the machine, the variety of forms possible to make, the great quantity possible to produce daily are some of the virtues claimed for the "Master."

The Waterloo Construction Machinery Company, Waterloo, Iowa, announces that the Perfection Tamper with concrete block and concrete brick attachments, formerly made in Minneapolis, has been taken over by them, and will be known as the Waterloo Perfection Tamper. The Wells Cement Products Co., Wells, Minn., and the New Munich Cement Products Co., New Munich, Minn., have recently purchased Perfection machines.

An amendment to the articles of incorporation for the Cement Products Co., Davenport, Iowa, makes several slight changes in the corporation. The company is authorized to extend its business by branch houses to other communities, and among the products sold by the company are to be included roofing materials and complete outfits for building houses. Austin Crabb is president of the company, J. Y. Bone is vice-president, and C. F. Drury is secretary and treasurer.

The Rensselaer Cement Tile Co., Rensselaer, Ind., has given up installing a branch factory at Goodland to manufacture tile for several large jobs they have contracted in that vicinity. Instead they expect to purchase a large truck and trailer, manufacture the tile here and haul them over to Goodland via truck.

Besser Mfg. Co:, Alpena, Mich., is mailing a circular devoted to the Besser automatic concrete building block machine. With this machine one man can do four or five times as much as he could do by using hand methods. A wonderful saving of labor is accomplished, which will more than pay for the machine in a short time. The blocks produced are uniform in size, of great strength and attractive in appearance.

The Humboldt Gravel & Tile Co., Humboldt, Iowa, reports busines extra good and prospects very bright for the coming season. They operate a Quinn drain tile machine and a Blystone mixer.

The Stark Sharkey Aldrich Co., Mt. Clemens, Mich., reports splendid business and bright prospects for their concrete blocks which are made in Besser molds and sell for 22 cents plain; 24 cents rock face, size 8x8x16. No facing aggregates used. Intend installing new machines in the near future for making roofing tile, building blocks, and brick. They have a Besser mixer.

W. R. Lane, a progressive contractor of Walnut Ridge, Ark., manufactures his own concrete brick, using a hand power Helm press. He writes: "I am making from 5,000 to 6,000 brick per day. I work six men. The brick cost me less than half what I would have to pay for the very same brick. My sand costs me $3.00, cement $5.60 for 1,000 brick. The work costs about $3.00, making $11.60 per 1,000 brick. The red cost me about 60c more and the granite cost me $1.25 per one hundred pounds. This will make 1,000 brick. I could sell all I could make, but am using them myself. Since I received my machine, I have built a Bank Building 25x100 ft., two stories high, an apartment house with six store rooms, and 40 rooms above, and am now building a Hotel 80 rooms with 7 store rooms below. This building will cost $60,000.00."

The capacity of the cement products factory of S. B. Shumway, Mesa, Arizona, has been enlarged. A new Helm brick press and other equipment has been installed and the curing sheds have been enlarged. He also operates Kellar Thomason sewer pipe and drain tile molds, Nebraska post molds, Pettyjohn block machines, making blocks 8x8x20 selling for 21 cents, Rex Jaeger and Standard mixers. Is interested in forms for making burial vaults and silo molds.

The Concrete Products Co., Muncie, Ind., which was recently organized is composed of W. W. Bailey, Malcolm Harriot and D. W. Bailey, who have bought a three-acre tract of land and will build a manufacturing plant. Concrete blocks, fence posts and porch columns, together with other concrete articles, will be manufactured. The company also will manufacture the W. W. Bailey fence post machine, a combination mixer and form which was patented recently.

Geo. E. Ryno has purchased the cement block business of Fred Wallace and is sparing no expense to make his plant at Wayland, Mich., an ideal one. He makes blocks 8x8x16, two parts sand and one part cement in Ideal molds. Has a Cloverleaf mixer.

Renn & Co., building supply dealers, Kaukauna, Wis., are having big success with their concrete blocks which are made with waterproof cement facing, 8x10x16 and 8x8x16. They sell for 24 and 26 cents. This company operates Ideal block and Ideal mixer machines. They intend to install new machines for making silos, brick and drain tile in the near future.

Concrete Products Corp., G. L. Lillard, Pres., Greenville, S. C., has increased capital from $5,000 to $25,000 and will enlarge plant; install additional brick and concrete roofing tile machines. They already have a Helm brick and block press.

The Foam Lake Cement Block, Brick & Tile Co., Foam Lake, Sask., Canada, has been incorporated with a capital of $20,000.

The Concrete Brick Co., Windsor, Ont., Canada, has been incorporated with a capital of $40,000.

The Farmington Cement Products Co., Farmington, Minn., has been incorporated, capital stock $25,000. F. J. Miller, president; Dr. J. A. Sanford, secretary-treasurer.

The Wells Cement Products Co., Wells, Minn., recently organized, are operating a Richmond and a McCracken drain tile machine, a Waterloo Perfection concrete block and brick machine; Northwestern cement post molds and a Wonder concrete mixer.

The New Munich Cement Products Co., New Munich, Minn., recently incorporated, operate a Waterloo Perfection block and brick machine, Richmond drain tile machine, Northwestern well curb molds and a Wonder mixer.

N. V. Wright, Arkadelphia, Ark., has organized the Wright Brick Co., and will establish a plant to manufacture concrete bricks.

The Concrete Products and Building Company, with offices at 622 Wheeling Bank and Trust Company building, Wheeling, W. Va., will start work on the erection of a large plant at Tenth street, Warwood, about the middle of this month. The company which was recently organized, is to manufacture cement roofing tile, building blocks, bricks, reinforced cement posts into which nails and staples can be driven with the same efficiency and durability as those driven into wood. Silo blocks and many patterns in tile and artistically finished building blocks will also be made in one department. A special fireproof garage will be featured.

The North Manchester Concrete Company, North Manchester, Ind., has incorporated with a capitalization of $100,000 to make concrete block column posts. The directors are Daniel N. Schubert, Milton V. Schubert and Carl C. Schubert.

The Arizona Shope Concrete Brick Company, Phoenix, Ariz., recently incorporated, capital stock $400,000 will make concrete brick for exterior, interior, fire places, mantels and floor tile in seventeen colors, ranging from snow white or ordinary brick color. The Shope patent machine made in Portland, Oregon, produces a concrete brick having a crushing strength of forty tons per brick, also making the face an absolutely waterproof and fireproof surface. Temporary office is with Jordon, Grace & Phelps on North Central avenue, where Mr. Maxwell, the factory expert, is located

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What is thought to be the largest contract of its kind ever awarded, was recently given the Cement Products Company, Wilmington, N. C., by the Rosemary Manufacturing Company, of Weldon, N. C., for 300 concrete septic tanks.

It will require about twenty-five freight cars to convey this number of tanks to Weldon.

Already the Rosemary Manufacturing Company have purchased about 300 tanks from the Cement Products Company, thus making the entire total about 600. When the present contract is complete the mill village at Weldon will be completely outfitted with these tanks making the largest single group in the United States.

The Rosemary mill owners state that since the first septic tanks was installed there four years ago much sickness has been eliminated, especially typhoid fever.

The Pennsylvania Concrete Roofing Tile & Cement Products Co., Lemoyne, Pa., was recently incorporated, capital stock $25,000. They operate a Walter concrete roofing tile machine and a Hobbs block machine, making blocks 8x8x16 for which they receive 35 to 40 cents and 8x8x24 blocks for which they receive 40 to 48 cents. They use white sand for facing their blocks. Would like to receive prices and catalogs on molds for porch columns. They also manufacture cement burial vaults (Automatic Sealing Vault Co.'s molds) and they operate Blystone and Wonder mixers.

The Valley Silo Co., manufacturers of Playford Rib Stone star silos, Fargo, N. D., in their latest issue of literature feature the fact that they have the distinction and honor of having erected the largest concrete stave silo in the world. It is located on the farm of C. A. Wickstrom, Lisbon, N. D., and measures 18x65 ft.

The New Jersey Sand & Gravel Co., Fred Clymer, president, Yardville, N J., will also manufacture block and brick and a considerable trade in this line is anticipated.

Mr. F. A. Costello, president California Pottery Company, 825 Chronicle Bldg., San Francisco, Calif., writes: "We contemplate the erection of a plant at Fresno, in the San Joaquin Valley, this state, for the manufacture of cement building blocks, roofing tile and irrigation pipe. We are desirous of learning all that we can regarding the manufacturing process. Could you recommend to us any books, or any source of information that would help us in this matter?

"The gentleman who is to be our superintendent has sought and secured employment with a firm manufacturing irrigation pipe. We intend to have him thoroughly learn the business before our plant is in operation. We desire to manufacture nothing but high grade articles, and will greatly appreciate any assistance or recommendations that you may give us in this matter."

The Georgia Paving & Construction Company, Columbus, Ga., have established a big business in the manufacture of concrete burial vaults. They write: "During the first six months we sold four vaults. We advertised, got people acquainted with the concrete burial vault and its merits. In the second half year we placed 95 vaults. Our original purchase was of two molds. Since then we have bought four additional molds to take care of our increasing business. Now we are placing between 600 and 700 vaults a year."

The National Cement Vault Company, Ashley, Ind., have built up a prosperous manufacturing business. They write: "We have had five years' experience in the manufacture of concrete burial vaults. Our business is increasing every day. We have had no trouble in getting the undertakers to take hold of our concrete vaults, as they say they can sell better caskets where it is used."

The McAdam Cement Works, Aledo, Ill., are manufacturing a product that prevents cement from sticking to the forms and product comes out with a smooth glossy surface, resembling the work of a trowel. Saves more than the price of other oils in labor. Gallon lots $1.25 per gallon. Five gallons or more $1.00 per gallon.

The Heim Cement Products Co., North Liberty, Ind., recently supplied their concrete staves and erected for a coal dealer five storage bins for coal. Each bin is 20 ft. in diameter and 13 staves or 30 ft. 4 in. high. Sufficient reinforcement is provided by $\frac{9}{16}$-in. rods encircling the pocket and placed 9⅓ in. apart.

Wm. Glaritz of Grass Lake, Mich., reports that he is exceptionally busy these days. He specializes in the manufacture of cemetery memorials. The mix for his monuments consists of three to one white cement and good washed fine gravel, and four to one of a little coarse washed gravel with ordinary cement.

A valuable treatise on "Concrete Stone Manufacture" is published by Concrete Publishing Co., New Telegraph Bldg., Detroit, Mich. The new volume covers more than 300 pages, with nearly 200 illustrations, and supplies as near a complete education on this kind of work as one can possibly get from a book. It includes chapters on the layout and equipment of plants; moulding and curing; surface treatment, shop records and cost keeping, etc., etc. The book sells for $1.50.

Concrete Machinery & Supply Co., 2014 Sante Fe avenue, Los Angeles, Calif., is equipping a new shop for the manufacture of the Brubaker concrete pipe machines. These machines are to be leased on a royalty basis to concrete products manufacturers in the far west. It is said that sufficient demands for machines have been received to keep the new shop busy for a year.

Ogden & Cadmus, building supply dealers of Bloomfield, N. J., operate their own plant for the manufacture of cement blocks, with a capacity ranging from 3,000 to 4,000 blocks per week.

The Blades Cement Block & Brick Co., Blades, Del., recently organized, is planning for the erection of a large plant for the manufacture of its specialties. A site has been secured and it is proposed to inaugurate immediate construction. Initial operations will be devoted to the production of cement building block and brick. The company is headed by Joshua Hare, James E. Lloyd and George W. Marine.

A company known as the Vermont Cement Brick Co., has been organized at Bellows Falls, Vt. It is capitalized at $10,000, and the officers are: F. J. De Forge, president; M. A. Chase, vice-president; Philias Grignon, secretary-treasurer; and William Williams, manager. The company has purchased a large sand bank and the initial output will be 15,000 brick a day. Considerable orders are already on hand.

The Prairie Concrete Products Co., Prairie du Chien, Wis., recently organized, will manufacture cement brick and block having purchased a Helm press, also Playford's Rib-stone stave silos.

News of the Sand and Gravel Plants

Blue Limestone Co., Broadway and K street, N. E., Minneapolis, Minn., produces annually 200,000 cu. yds. of sand and gravel from a pit deposit, the material being washed, screened and graded. A Bucyrus steam shovel is used in excavating, 5-yd. dump cars conveying material to plant, where electricity is used for power. The company is adding to its output by increasing the efficiency of the various units comprising the operation.

J. H. McNamara, Inc., sand and gravel producer, 298 North Harvard street, Allston, Mass., is making extensive improvements which will double their present capacity. At their Watertown, Mass. plant they are installing an electric digger, made by Meade Morrison Mfg. Co. An electric digger is also being installed at their Wellesley, Mass. plant made by National Hoisting Engine Co. A great amount of their material is delivered by truck to greater Boston.

The Hawkeye Fuel Co., Spokane, Wash., reports splendid business and bright prospects for their sand and gravel. They operate a Sauerman drag line cableway excavator and a Universal Cedar Rapids crusher.

Lease rights on sand and gravel in the bed of the Willamette River between the Oswego bridge and the Hawthorne bridge in Portland have been granted by the Oregon state land board to five Portland companies, namely, the Diamond O. Navigation Company, Nickum & Kelly Sand & Gravel Company, Columbia Digger Company, Columbia Contract Company, and the Star Sand & Gravel Company. The lease covers a period of five years, the lessees to pay the state at the rate of ten cents per cubic yard for all sand or gravel taken from the river under the contract, with a minimum of 10,000 cubic yards to be used by each company per year.

The Atlas Sand, Gravel & Stone Company, Unionville, Conn., is just installing an elaborate equipment for handling material. This replaces one in use only three years, but that has proved inadequate to the growth of the business. The new equipment consists of a steam shovel on caterpillar traction. This shovel will dig and deliver to a field hopper up in the neighborhood of 250 cubic yards of material per hour. From the field hopper, the sand and gravel, with larger boulders excluded, will be taken by a gasoline locomotive, six ton capacity, hauling two twelve yard bottom dump industrial cars, run on standard track. The locomotive will deposit the cars at the foot of a 20 degree incline and the cars will then be drawn up by cable and dumped automatically into a receiving hopper, thence running through two crushers, one for oversize, and distributed on a 235 foot, 28 inch belt conveyor, operating at 20 degrees and delivering into four different sizes, thoroughly washed and delivered bins and from thence by trolley and truck for distribution to many local industries and construction work.

It has been officially announced through Harry Donnelly that the Ohio Gravel Ballast Co. is the name of a new Ohio sand and gravel company which operates five plants. Mr. Donnelly, who is vice-president and general manager of the new company, with main offices at 2103-2106 Union Central Building, Cincinnati, Ohio, says that on July first this new company was incorporated.

It will operate the sand and gravel plants formerly owned and operated by the Miami Stone & Gravel Co., Miami Grove, Ohio; the Cincinnati Crushed Stone and Gravel Co., Miamiville, Ohio; the Ohio Ballast Co., Gravel Pit, Ohio; the Trenton Sand & Gravel Co., Trenton, Ohio, and the Greenville Gravel Co., Cincinnati, Ohio.

This extensive operation will make the Ohio Gravel Ballast Co. the second largest in the state of Ohio and one of the largest in the whole country. All of these plants are large and well equipped to produce large quantities of good, clean material.

Harry Donnelly, the vice-president and general manager, is well known among sand and gravel producers of the country because of his extensive activities in both the National and Ohio sand and gravel producers' associations, having been president of the national association during the past several years.

The Central Texas Gravel Company has recently been organized in Dallas, Texas, and will be prepared to ship gravel in the near future from their pit located about nine miles from the city.

The Caddoo Sand & Gravel Co. of Shreveport, La., will open a new gravel pit at Sibley, La., in which they will use their new Class Fourteen Bucyrus Dragline Excavator for digging the gravel. This company turns out a high-grade gravel for road construction and now has orders in hand for the furnishing of gravel to a large number of districts for new roads.

News of the Crushed Stone Quarries

Work has started on the erection of the big rock crushing plant at Tempe, Arizona, by Twohy Bros. Construction company, to furnish crushed stone for the 283 miles of cement highways in Maricopa county, according to county officials.

Teams are busy grading preparatory to the laying of a three-quarter mile spur from the Arizona Eastern railroad track to the plant and as soon as the tracks are laid it is hoped to have the plant far enough completed to install machinery, which will be shipped here from Seattle and other points where the construction company has completed big projects.

The rock crushing plant, now under construction at Tempe, will be large enough to supply rock for the five or six road building units that the company intends to operate continuously on as many different sections.

Until this plant is completed and in operation, little will be done on road construction, it is said, although a small amount of grading may be done in preparation to laying the concrete as soon as the plant is in operation.

The plant will be able to supply rock for a six-inch road just as easily as for a four-inch, as was originally planned. A six-inch road is said to be more durable than the four-inch and is fast becoming standard throughout the nation. In order to lay the six-inch an additional $4,500,000 bond issue must be voted, and this is being contemplated.

The Palmer Lime & Cement Co., York, Pa., now have their plant in excellent condition and are in a position to handle a rapidly growing business. They have a daily capacity of 100 tons and operate a No. 4 K Gates crusher, No. 3 Williams hammer mill and are installing a Raymond 5 Roll Mill.

The Thurber Earthen Products Company of Thurber, Texas, are completing a modern electrically operated rock crushing plant, costing about $450,000 from plans and specifications by Preston K. Yates, consulting and designing engineer, 120 Broadway, New York, N. Y. The equipment consists of a 48x60 inch jaw crusher, from No. 6 gyratory crushers, water tank boilers, turbine and accessories, etc.

The Davis No. 1 Blaster, something new in the way of blasting machines, is being placed on the market by the Atlas Powder Co. of Philadelphia. This device is a small instrument weighing only 3¼ pounds, and it is described as being very powerful for its size, developing ample current to fire five 30-foot copper wire electric blasting caps, or five 6-foot iron wire electric blasting caps, connected in single series. The dimensions of this blaster are 2x4x4½ inches, and it has a strap for carrying.

The Leathem D. Smith Crushed Stone Company, just incorporated at Sturgeon Bay, Wis., will operate on a very extensive scale. The Lake Shore Stone Company of Milwaukee, the only large competitor of the quarry has abandoned water shipments, leaving a larger field for the local concern which will increase its transportaton facilities by additional boats. Increased storage capacity, from 15,000 tons to 35,000 tons, has been accomplished during the past winter by many changes and a practical rebuild at the quarry. New trestle piling has been put in which handles two large conveyors housed in two concrete reinforced tunnels each 250 feet long. The conveyor belts are 30-inch and will handle stone at the rate of 300 tons each an hour. The big crusher has also been enlarged, permitting the handling of larger rock. Two-ton stone cannot be crushed as easily as the smaller pieces. All machinery at the plant has been overhauled and 8 additional 5-ton cars have been purchased

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F. M. Rudd, Bronson, Mich., wants responsible parties to erect and operate a hydrated and agricultural lime producing plant on his property, formerly owned by the Bronson Portland Cement Co., located on N. Y. C. R. R. 200 acres fine marl land with commodious steel and cement buildings with large storage capacity already built. Desire to furnish marl, buildings and equipment on hand on royalty basis

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The Nast Brothers' Lime & Stone Company, Marblehead, Wis., have just closed a contract for the complete electrification of their plant to replace steam, which has been the means of power since the company has been in existence. The company will purchase the current, which will amount to 440 volts, and this will operate machines generating a total of 300 horsepower. The individual motors will vary from 15 to 50 horsepower. The lighting current will be cut down to 110 volts. All wiring will be of conduit construction: that is, all wires enclosed in steel pipes, the last word in safety and modern electrical construction. It is expected that the work will be completed in two months.

The Lakeshore Stone Co., Milwaukee, Wis., is dismantling its Belgium, Wis., plant. The "Old Faithful" No. 9 Gates crusher at this plant was the first of its size ever built. It has been in service nearly 20 years anad will be moved to the company's Lannon plant and re-erected. This scarred veteran is in first-class working condition and is good for many more years of busy rock crushing service. The Belgium plant which is being dismantled and the quarry abandoned was one of the largest and most complete rock crushing plants of its day. It was described in "Engineering News" at the time of its completion and was conidered a model plant.

The Federal Crushed Stone Co., Trust Building, Dallas, Texas, has been organized with a capital of $1,000,000. The plant will be at Chico, Texas, and will cost $200,000, and will be constructed by the company. The crushing plant will be modern and fireproof and will have a daily capacity of 2,000 tons of crushed stone per day. The incorporators are Emmett Thurmon, president and treasurer; Frank E. Smalley, vice-president, and Leon Thurmon, secretary.

The Federal Crushed Stone Co., 628 Plymouth Bldg., Minneapolis, Minn., has equipped their plant with every modern appliance for quarrying. The daily capacity is 100 tons per hour. They operate three Austin crushers, two No. Fives and one No. Eight and also a Bucyrus traction type steam shovel, 1½-yd. dipper.

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Organic Impurities Injure Concrete

Tests made in the Structural Materials Research Laboratory with the co-operation of Lewis Institute and the Portland Cement Association show that the long recognized injurious effect on concrete of organic ingredients is a fact. These tests, reported by Prof. Duff A. Abrams at the recent meeting of the American Society for Testing Materials, give quantitative results. It was impossible to secure natural sands containing graduated percentage of organic impurities for a study of the quantitative effects of such impurities, so the laboratory prepared aggregate samples in which known quantities of organic impurities were present by applying tannic acid as a surface coating in quantities up to 0.4 per cent by weight. Compression tests were made on 3 x 6-in. concrete cylinders. The mix varied from 1:5 to 1:2; the size of aggregate ranged from fine sand to a ¾-in. graded aggregate. Tests were made on all mixtures and sizes of aggregate at ages of seven days, twenty-eight days, three months, one year, and two years. Specimens were stored in damp sand. The series included about 2,000 concrete tests. The following are the principal conclusions from the investigation:

The strength of concrete was reduced for all percentages of tannic acid, for all mixes and ages covered by these tests. Less than 0.1 per cent of tannic acid in terms of the weight of the aggregate may reduce the strength of the concrete to one-half its normal value.

Lean mixtures are more affected by tannic acid than rich ones.

The mixtures from the finer aggregates are less affected by tannic acid than those from the coarser aggregates.

All of the effects mentioned above may be summed up by saying that the reduction in strength of concrete is a function of the *concentration* of tannic acid in the mixing water. An equation is given which represents this relation for the 28-day tests.

The results of these tests indicate that the wetter consistencies would be less affected by the presence of organic impurities than the drier ones.

The strength falls off rapidly for small percentages of tannic acid and less rapidly as higher percentages are reached.

The 7 and 28-day strengths are reduced to a greater extent by tannic acid than at ages of 1 and 2 years.

Some of the 1:5 mixes in which the higher percentages of tannic acid and the finer sands were used (2 to 3-percent solution) disintegrated before the time of test. The 1:7 mixes (3 to 5-per cent solution) were destroyed in removing the molds.

The tests confirm the results of many other investigations made in this Laboratory in showing the fundamental dependency of strength on the quantity of mixing water as expressed by the water-ratio.

The strength of concrete (stored in a damp place) both with and without tannic acid increased with age. The strength for a given condition was a logarithmic function of the age.

The Building of Modern Highways

The Cost of Not Building Highways Is Too Great to Estimate. They Are the Radiating Rays from Our Centers of Intelligence

"No expenditure of money is to be considered when mind-diseasing ignorance is existing anywhere in this broad land.

The safety of a republic is in the intelligence of its citizens who are wise to the world and their own interests. This is promoted by the freest communication," writes Mr. F. Baackes, vice-president and general sales agent, American Steel & Wire Co., Chicago.

"It is a sin of omission to leave undone so great a thing as building means of free, pleasurable communication with our utmost interiors. It carriers the heavy penalty visited upon the unprofitable servant in the parable of the ten talents—the curse of outer darkness that has descended to us through the ages.

"It is represented by the groups of curses we continually have around us whereby our springs of intelligence are muddied or dried up and the wonderful human mind thus poisoned or starved, becomes an awful danger to our civilization. If we take the sum total of the causes of all our troubles we will find the sin of omission—not doing—is the mother of the sin of commission.

"The world has become such an intricate machine that its operation is the problem of the keenest brains in order to secure equal justice and happiness for all. History shows that where such brains has been killed off, civilization has many times died. Neither a great state nor a great business can be sustained by other than master minds; but it must not be forgotten that all the people must be so ministered to that they also may have a high order of equally distributed intelligence, otherwise they will arise and crucify the master minds and in so doing also crucify themselves.

"The first duty of the state is therefore to bring its people up to the highest intelligence, let all else be what it may. Solomon asked for wisdom first—all else followed.

"Throw the searchlight into our darkest interiors—it will repay any cost. Get the people circulating as there is wisdom in contact. One splendid means is to build hard, reinforced concrete highways that will be a pleasure to travel in all weathers and seasons. There are no dark-shut-up periods for a community with such roads."

How Can Laboratory Tests of Concrete Materials Be Made of Greater Value to the Field Engineer and Contractor

By G. M. Williams, Associate Engineer U. S.
Bureau of Standards

Why are the results of tests and recommendations of the laboratory given so little consideration and so often disregarded by field engineers and users of concrete? That the field engineer and the contractor do not fully accept the tests and the advice of the laboratory, whether really good or bad, must be admitted by any one who is familiar with conditions in the laboratory and in the field.

Off the job, the practical user of concrete may give respectful attention to the advice from the laboratory, but on the work he is inclined to forget the procedure outlined for his guidance and return to his usual practice which he feels is satisfactory and has given him good results in the past. Beyond question, the disregard of such advice may in some cases lead to inferior work, but owing to the meager amount of testing of field concrete which is done, inferior work resulting from such a policy may never properly be impressed upon the responsible party.

Field Engineers Disregard Laboratory Tests and Conclusions. Concreting processes have for the most part been developed through years of practice in the field, rather than by work in the laboratory, and the field engineer is disinclined to make any changes in his methods which will result in any great variation from his usual practice. Without much aid from testing laboratories, good concreting practices have been developed as a result of years of experience, and from the engineer, down to the foreman on the job there is a tendency to avoid any changes in procedure which may disarrange the old established methods, or seem to increase concreting costs.

Such an attitude on the part of the field engineer and contractor is sometimes due to expensive experiences which have resulted from the use of materials and methods which have been recommended by the laboratory. Unworkable mixtures may have been specified which resulted in bad work, delays, and increased costs, or the following out of such advice may have required changes on the job in materials or plant equipment which increased costs with no apparent improvement in the quality of the work. One or two such experiences are certain to cause laboratory advice to be shunned, and cause the engineer to fall back on well tried methods derived from experience, which he knows will furnish satisfactory results with reasonable expense.

That such a disregard for laboratory tests and recommendations is often justified can be made clear by a consideration of the practices, and lack of practices which are employed in laboratory work. While it is not claimed by testing engineers that laboratory methods are complete and entirely satisfactory, this does not obviate the fact that the field engineer's disregard for laboratory tests and conclusions can be blamed to lack of progress in developing laboratory methods of testing, and in applying in laboratory practice a knowledge of the obstacles and adverse conditions which the latter must meet and overcome "on the job."

Lack of Agreement on Tests and Methods. To begin with, testing laboratories are not in accord as to what methods of tests should be employed in determining the value of any given materials for use in concrete.

An inspection of reports of tests indicates the lack of agreement among different laboratories as to what tests should be made, and what methods should be employed. In planning a series of tests, consideration may be given to proportions, method and time of mixing, consistency, size and shape of test specimens as well as special tests, such as colorimetric, hardness of particles, silt, etc. There is little agreement as to whether materials should be proportioned by weight or volume, how weight per cubic foot of aggregate should be determined, what portion of the sand should be classed as silt, or how its quantity should be determined.

Often only a few of the above mentioned factors may be given consideration due either to lack of testing equipment, or lack of appreciation of their necessity. As a result, some of the essential and important features which should be determined by test may be disregarded, and erroneous and misleading conclusions may be drawn from the few test data obtained. The most essential test data, which may in some cases explain why improper conclusions have been drawn, are often omitted as of no importance, and the conclusions may be so opposed to the well established results and experience of the field engineer that he is fully justified in his refusal to be governed by the results of the test data. The wide variation in tests results which have sometimes been obtained by groups of laboratories using similar materials in a specified manner by skilled operators, furnishes additional evidence that something is lacking in laboratory practice. A few of the laboratory methods which are sometimes responsible for such a condition of affairs are worthy of more detailed consideration.

Laboratory Methods that Sometimes Are Source of Error. Tests have repeatedly shown that the value of a sand for use in concrete cannot be determined by its use in a mortar, but that it should be employed with the same coarse aggregate which is to be used on the work. Sands which may be condemned as a result of tests in a mortar, may be satisfactory for use with a properly graded coarse aggregate. Any specifications for sands which limit the amount passing any given sieve are no doubt in many cases due to results obtained in mortar tests, and good concrete sands have been rejected because of such false conclusions based upon improper methods of test. To base judgment of a sand on tensile mortar tests is a still further step in the wrong direction and cannot be too strongly condemned. In some classes of work where a mortar is used the tension test may be proper, but the mortar test, either in tension or compression, is of little value in evaluating a sand for use in concrete.

The use of dry laboratory mixtures, unworkable under the usual field conditions, is another source of error sometimes encountered. This applies to tests of both mortars and concretes. A consistency which appears to mold well and produces good laboratory test specimens may be entirely impossible in the field, with the result that when the concrete is made on the job more water must be used to obtain a workable mix. A much weaker concrete than the laboratory tests would indicate is certain to result. It should be realized that in molding a laboratory test piece, consider-

able energy is expended in forming a small compact mass which is free from reinforcing steel and other obstructions, while in the field a small amount of energy is usually expended in placing a large volume of concrete which must flow in around a network of steel rods. Based on labortory tests proportions of sand and gravel may be recommended which result in such a harsh, unworkable mixture that excessive amounts of mixing water, resulting in subsequent loss in strength, must be used for its proper placing. In case comparative tests are being made on materials from two sources of supply, the aggregate which may be judged inferior, may actually produce the stronger concrete in the field where a workable consistency must be used.

In laboratory tests the fact is sometimes overlooked that such a consistency as will result in maximum strength, or even approach such a value, will be entirely unworkable in the field. Some strength must be sacrificed to ease in handling and placing. Very often other properties are equally as important as compressive strength, yet most laboratory work is seemingly based upon the assumption that other properties increase proportionally with the increase in compressive strength. Experience in the field has indicated that this assumption is not true, and that concrete which must withstand water pressure, for instance, can well sacrifice strength for water tightness or impermeability.

Natural sands are often tested in comparison with standard Ottawa sand, using the quite dry consistency specified in laboratory tests of cement. Such so-called normal consistency mortars are too dry to be properly workable and should not be employed in tests of sand. The quality of mixing water is insufficient to furnish a plastic, workable consistency, with the result that unnecessary errors are introduced both in mixing and moulding which would otherwise be avoided. The attage based on the total weight of the mix, or upon the cement content alone, but such a figure is of little value in itself because of the wide variations in water requirements due to great variations in surface areas or number of particles in a unit volume of different aggregates.

The cylinder slump test has been proposed as a means of measuring and controlling the consistency. However, tests have shown that while this apparatus has some merit when working with very rich mixtures, or for controlling the consistency of the same proportions of the same aggregates, it often gives very erratic and misleading results when used with aggregates of widely varying granular composition which are met with in the laboratory. The range of water content which can be accurately measured under ideal conditions is rather narrow, and when carefully used with the same aggregate has resulted in such absurdities as a 1:2½:5 concrete being stronger than a 1:2:4 proportion.

Lack of means for accurately recording and expressing consistencies of mixture has made it difficult to make real progress in studies of concrete aggregates. Results show that the same operator cannot duplicate the same consistencies with any degree of accuracy, and the task of comparing the results obtained in two different laboratories when working with different aggregates, is almost hopeless, since the figures for per cent of mixing water mean little under such conditions. Were it possible to assign some accurate and definite values to this most important property, the results obtained in different laboratories would be comparable after taking into account the physical properties of the cements used. Such a scheme would be of very great value to the field engineer, since the laboratory, in testing any aggregate for field use, could state the range of strength values which might be expected for different consistencies of the same proportion. Determination of the consistencies from time to time on the job would then permit of close estimates of the ultimate strengths which might be expected for that particular lot of concrete. Occasional strength tests would permit any slight adjustments to be made in the range of strength values used in case the field concrete values should differ greatly from the laboratory tests, due to curing conditions, etc.

Due to the present lack of means for measuring and controlling consisteney, and the apparent failure to recognize its importance in connection with laboratory tests of concrete, the test data obtained in the many different laboratories must in most cases remain as small and isolated groups of tests, none of which bears any definite and known relation to those of another laboratory, since there is no common basis for comparison.

Consideration of the above methods and lack of methods in the laboratory can only lead to the conclusion that the field engineer and contractor are often justified in giving scanty attention to the results of laboratory tests and recommendations. There is no doubt that the causes for such a condition can be eliminated by devoting more attention in the laboratory to the conditions under which the concrete materials must be used in the field. A full appreciation of the limitations and requirements of the process of producing and placing concrete "on the job" will do much to eliminate "laboratory specifications" for concrete, which so often result in confusion and expense before their impracticability can be impressed upon the engineer who is responsible for their enforcement. The assistance which the laboratory should render to the practical user of concrete is great, and should result in bettering the quality of field concrete and the methods which are used in producing it, but such tests and recommendations which will assist in bring about such improvements must result from the application of proper laboratory methods which take into account the conditions met with in practice.

Air Compressors, Drills, Hammers, Etc.

The Sullivan Machinery Co., manufacturers of mining and quarrying machinery, 418 Gas Bldg., Chicago, have issued several new bulletins concerning late types of air compressors, drills, etc. Bulletin 75-T is particularly interesting. It relates to the WK-31 portable air compressor gasoline-engine driven, designed principally for operating drilling tools for rock removal in highway construction, although it can be employed for other purposes demanding a portable compressor. Another is Bulletin No. 74, relating to drill steel furnaces which have been designed especially for large users of rock drill steel. These furnaces embody the most up-to-date ideas in this type of engineering. There are also several other bulletins about other kinds of compressors, besides drills, forge hammers, etc., and booklet 121 is devoted to detailed descriptions and pictures of the Sullivan compressors.

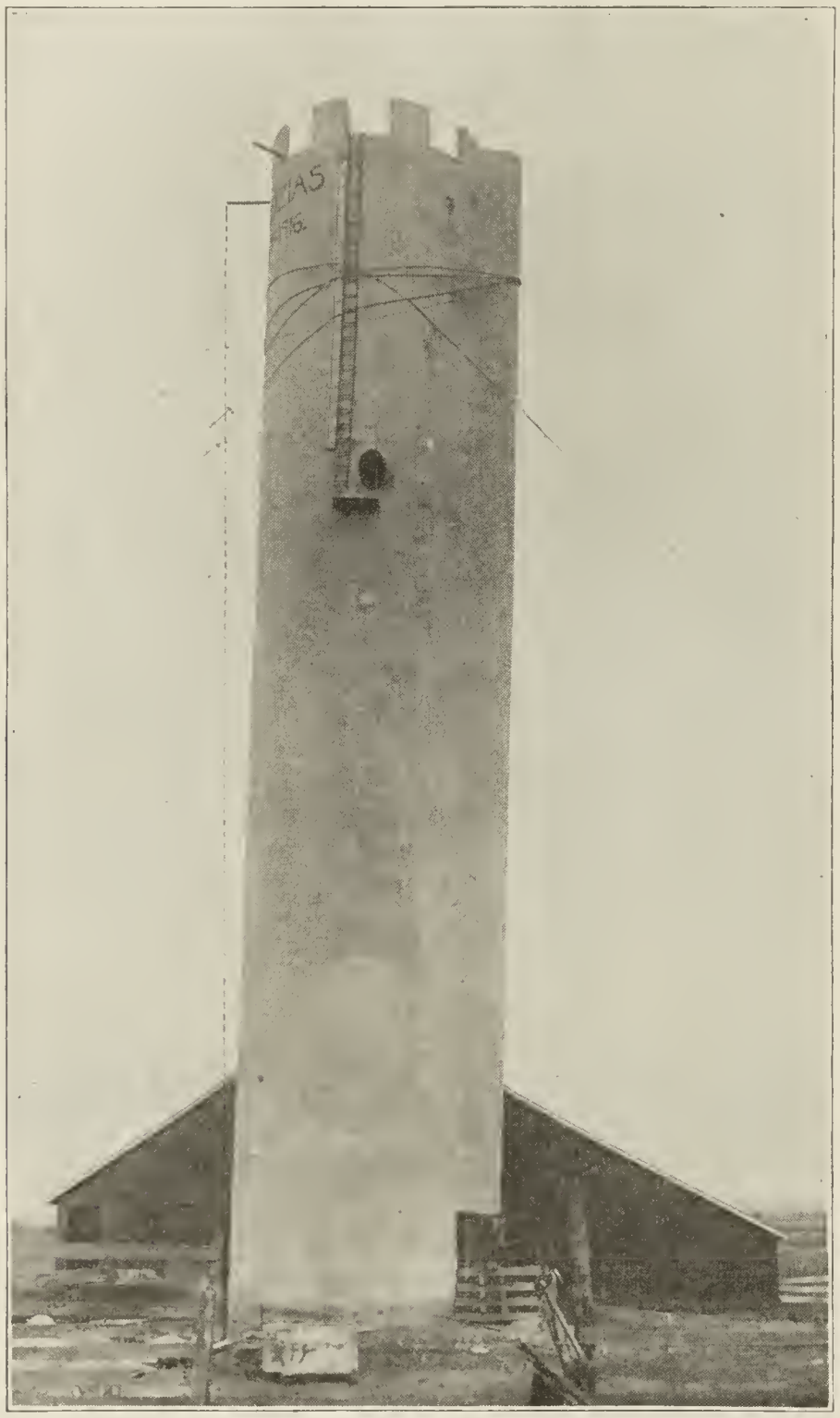
Straightening Up a Leaning Silo

Bringing it Back to Perpendicular From a Variation of 46 Inches

BY A. S. MIRICK

On the farm of E. J. Ozias, Center View, Mo., a Polk System silo and water tower had been constructed. Due to some irregularity in the width of the foundation ring, also to the added weight of the chute on one side, it began to lean and went over until the top was 46 in. out of perpendicular.

The tower had an inside diameter of 16 ft. and was 80 ft. high with a 16 by 24 ft. water tank in the top. The foundation went 3½ ft. into the ground and the first thing the contractor did, after firmly fastening his guys around the top of the tower and thus anchoring



When work began, showing ropes attached to silo preparatory to help pull it straight, position of guys when ready to move.

it, was to dig a trench some 3 ft. and 9 in. deep half way round the tower and on the high side. This trench went down just enough below the bottom of the foundation to give the workmen good auger room.

He next bored a series of 2-in. holes, about 2 ft. apart, toward the center of the base under the foundation; then gave the silo some hours to begin to come back to pumb. Later he bored another series of holes half way between those of the first series, thus making a complete ring of 2-in. holes 1 ft. apart and extending half way round the silo under the foundation of the high side. It took the silo approximately three days to settle back gradually into a perpendicular position.

The next thing was for him to devise a way to hold it firmly in this position—that there might be no future leaning.

He, therefore, fastened a series of 1 in. deformed brace bars into shoulder holes in the silo wall, letting the top of the brace bar come 6 in. below the grade level, and the bottom extend out 3 ft. Thus the bar stood at an angle of 45°. These brace bars were placed every 12 in. on the silo wall, extending entirely around it. A couple of ring bars, of similar material, were put over the brace bars—one 6 in. up from the bottom, the other 6 in. down from the top. This reinforcement then was filled in with concrete.

When this was completed the silo not only stood plumb, but it had an added bearing in the new foundation which held it in perfect position; and all for an approximate cost of $150.

Many silos are built with insufficient foundation, as this one was, but the ingenuity of the contractor remedied the deficiency in a comparatively short time and at an extremely moderate cost. That sort of contractor is well worth having in almost any neighborhood.—"Successful Methods."

Proper Backgrounds for Stucco

We recently observed a section of stucco that had been removed from a bungalow where Portland cement exterior stucco had been used. The background was ordinary wood lath spaced about half an inch apart and the outer surface covered with two-inch mesh poultry netting, well stapled.

Although the work was over three years old, the netting imbedded in the scratch coat mortar was still as bright as the day it was nailed over the lath. This seemed to the observer an ideal background method, for the netting had taken up the stress of the mortar and eliminated all possibility of contraction.

The high cost of wood lath has increased the use of other practical backgrounds, such as welded sheeting, galvanized metal lath, and also metal lath itself.

Where metal sheeting is used it is not necessary to back plaster. The horizontal and longitudinal wires are pressed forward and imbedded in the scratch coat mortar when applied and any possibility of corrosion from interior dampness is eliminated. But it is absolutely essential to back plaster if corrosion is to be prevented in the case of metal lath construction, where painted lath is used.

If brick lath material is used as a background, both the front and back of the material protect the carrying wires and when the mortar penetrates through the key it forms a button on the inner surface, thereby insuring perfect safety from corrosion.

By the use of Medusa waterproofing or waterproofed cement the stucco, concrete or mortar is made impervious to water protecting the reinforcing welded sheeting or metal lath from rusting and corrosion.—Medusa Review.

Concrete Road Construction in Nebraska

Chief Construction Engineer, Nebraska Department of Public Works

Nature has been niggardly to Nebraska in the matter of bestowing materials for hard surface roads. The stone supply is confined to the southeastern portion of the State, and consists of limestone deposits of varying hardness. Some samples show a French Coefficient of wear of eight, but the hard stratas are so distributed in the quarries that it is almost impossible to get a uniform product that would be suitable for an aggregate for concrete pavement.

The Platte River runs through the central part of the State, and for ages it has been rolling down the feldspar and quartz rock from the Rockies and depositing the same in Nebraska; so that in many places this material is pumped up, screened, and graded, and makes splendid aggregate for concrete. The material in question, however, violates a favorite condition that Engineers have made a part of their fine aggregate specifications, viz.; that the particles must be sharp. This theory has been proven falacious, for the rounded particles if they are clean and hard, have been found to develop more strength than the sharp variety.

The material pumped up from the Platte River has another characteristic that has caused engineers to be cautious, that is its fineness. One who is familiar with Prof. Abrams' tests, knows that he has developed a theory that if a material shows a certain modulus of fineness, depending upon its grading, this material may be composed of any sized aggregate. Even the grading is relatively unimportant in comparison with water content. With this theory in mind it was decided to send a sample of the Platte River material to the testing laboratory of the Bureau of Roads, Department of Agriculture, Washington, to determine whether so called Platte River gravel would meet with their approval for use on concrete paving work in Nebraska. This matter was an important one as it meant utilizing the greatest supply the state has for paved road. The analysis of the sand-gravel mixture was as follows:

Passing ¾″ mesh screen and retained ½″ screen	2.0
Passing ½″ screen and retained ¼″ screen	12.7
Passing ¼″ screen and retained ⅛″ screen	85.5
Retained on ¼″ screen	14.7%
Passing ¼″ mesh retained on 10 mesh	44.4
Passing 10 mesh retained on 20 mash	27.9
Passing 20 mesh retained on 30 mesh	5.5
Passing 30 mesh retained on 40 mesh	3.1
Passing 40 mesh retained on 50 mesh	1.3
Passing 50 mash retained on 80 mesh	1.9

Method of handling concrete aggregate. Note bucket loader.

Loading Ford trucks with sand-gravel. No horses were used on this job.

Receiving the cement. Each truck load of material represents a batch of concrete.

The finishing machine. Note the forms. They also serve as a track for the finishing machine.

Passing 80 mesh retained on 100 mesh.....	0.2
Passing 100 mesh retained on 200 mesh.....	0.5
Passing 200 mesh	0.5
	100.0
Loss by washing silt and clay	0.4

The sample consisted essentially of rounded fragments of granite, quartz quartzite, with a large amount of subangular quartz sand.

Samples of the material were tested for compression and compared with Potomac River screened gravel. The mixture of the Platte River sand-gravel was one part of cement by volume to three parts of the sand-gravel.

The Potomac River material was used in proportion 1 part of cement, 1½ part of Potomac River sand, and three parts of Potomac River gravel measured by volume. The dividing line between sand and gravel, of course, being ¼" mesh screen; all that was retained on this screen was considered gravel, and all passing through considered sand.

6"x12" cylinders were prepared of concrete made from both materials and aged 7 days. Two test samples were prepared of each. The total loads sustained by the cylinders of Platte River gravel were 58,350 lbs. and 65,940 lbs. with an average of 62,145 lbs.

The total loads sustained by the cyliners of the Potomac River gravel were 57,780 lbs. and 58,180 lbs. with an average of 57,980 lbs.

The average unit crushing strength of the Platte River sand-gravel concrete was 2,198 lb. per sq. in. The average unit crushing strength of the Potomac River gravel concrete was 2,050 lb. per sq. in.

As a result of this test it was decided to use this material for paving with concrete a portion of the Lincoln Highway 5.94 miles in length running from Fremont to Ames.

The plans for this stretch of concrete paving called for a pavement 18 feet wide the thickness in the center being 8 inches and the thickness on the sides 6 inches, the pavement being laid in blocks 36 feet long with a ½ inch elastic expansion separating each block.

The Platte River runs parallel to this road and material for the aggregate could be obtained with very easy hauls direct from the plants operating along the river in the immediate vicinity of the road.

Consequently the contract was let for the construction of the road at a cost of $199,440.34. The features of this road that made its construction different from the ordinary construction of concrete roads are:

1. The use of aggregates of this character is such a radical departure from the accepted practice as to excite considerable interest.

2. The construction methods, while not original are novel, owing to the fact that labor has been reduced to a minimum by the installation of the most modern machinery.

The subject aggregate has been quite fully discussed, and I need only add that the gravel is dredged from the shores of the Platte River. The effluent from the pump carries the sand and gravel to a series of sorting screens and chutes, where the fine and waste materials are returned to the lake pit.

The material to be used is delivered into the bins ready for truck loading. The material is then hauled to piles located at convenient places along the road for storage. The hauling from the bins to the stock pile is done by trucks.

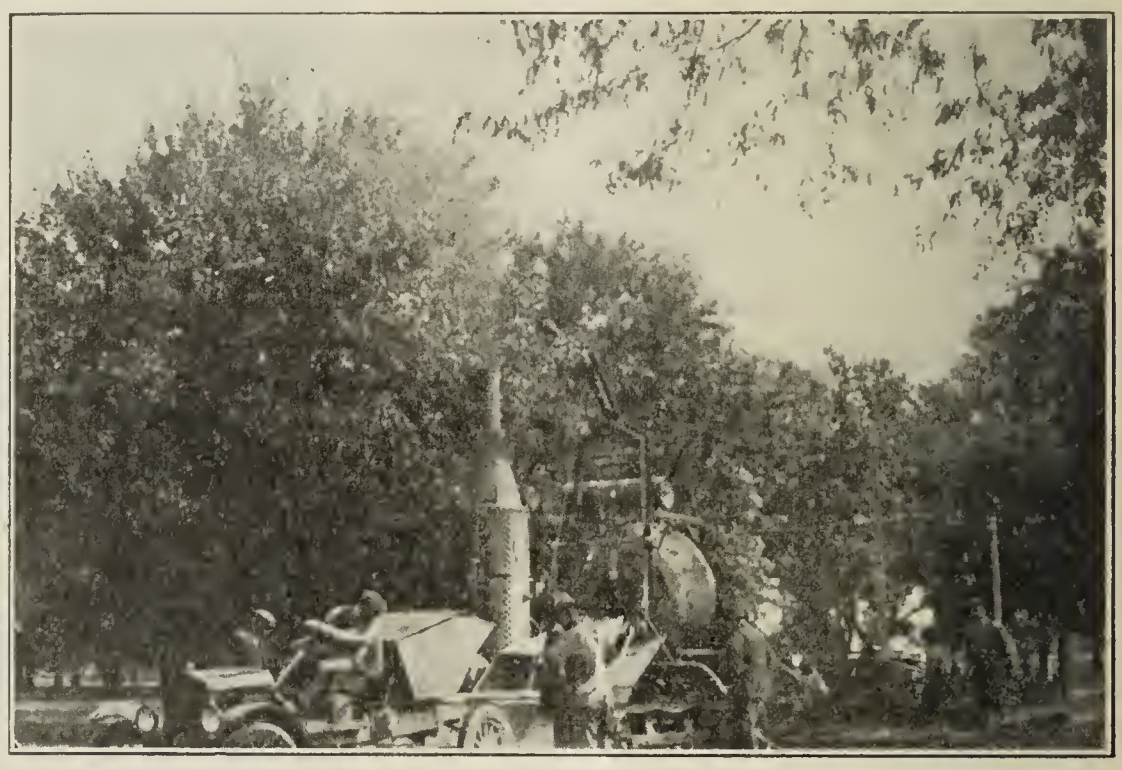
Equipment

Near these stock piles a platform for storing cement bags has been erected, and all of the charges for the mixer are carried from the stock piles by means of Ford trucks. These Ford trucks are equipped with Lee dump bodies holding 21 cu. ft. of sand gravel mixture. The sand-gravel mixture is loaded on the trucks by means of an automatic loader. This charge is rushed to the mixer, dumped, and the truck returns at a 50 mile an hour gait for another load. The advantages of this manner of handling material from the stock piles to the mixer over the old method of hauling by teams are as follows:

1. The sub-grade is kept in good condition ahead of the concrete by the action of the over-sized tires of the Fords.

2. The speed of operation of the trucks obviates the confusion and congestion that occur with teams, since many teams must be on the road to handle the same amount of material.

3. It eliminates the old time skinner, who sleepily dozed over a pair of mules, and utilizes the young



Dumping the batch into the mixer.

The finishing machine in operation. Note the finished pavement in the foreground.

man whose who has a real interest in motor vehicles, encouraging him to work at something he really likes and helping to solve the labor question.

4. Above all it greatly diminishes the number of men required, and entirely eliminates the difficulties of using teams.

The concrete is mixed in a large three-fourth yard Boss concrete mixer. This mixer is equipped with caterpillar tractors that distribute the load of the mixer on the subgrade at a pressure of about 4½ pounds per square inch. The ease with which this machine can be moved forward with little damage to subgrade makes it an ideal machine for concrete paving.

The forms used are pressed steel forms that combine the qualities of a form with a track to receive the finishing machine. The Lakewood finishing machine used is both a money saver to the contractor, and a source of joy to the engineer. This machine automatically cuts out the finished section of the road by means of a steel templet attached to the front of the machine. A short distance back of this templet is a curved tamper that tamps the road evenly to the exact finished cross section. Behind the machine is mounted a belt that rapidly passes back and forth across the pavement and puts a finish on the work that cannot be equalled by hand. The whole machine is motor driven, and when once started needs no attention.

Construction Methods

The work was started at the end farthest from the source of supply. The sand-gravel mixture and cement was brought to the mixer, dumped, and hoisted into the drum. About 6 per cent of water by volume measured by a gauge attached to the mixer is then run into the drum and the whole thoroughly mixed. The product of the mixture is run into the forms by means of a chute and roughly placed. The consistency of the concrete is such that it will roll down the chute with a little help from the spreader. The finishing machine is started and the section completed immediately. An edge is then run along the form to give the slab a finished appearance. The pavement is laid in sections 36 feet long, each section being separated by an expansion joint ½ inch thick.

Curing

As soon as the concrete is set, if the temperature is high, the pavement is covered by a tarpaulin. This is romeved after a short period and a covering of not less than two inches of earth is applied and kept moist for a period of not less than 10 days. The road is closed for traffic for 14 days. The shoulders are then constructed and the entire roadway finished up as the pavement progresses.

Testing Materials

The cement is tested according to the specifications of the American Society for Testing Materials. laboratory having been equipped for this purpose in the field.

Sieve analyses are made of the sand-gravel aggregate from time to time. Very close watch is kept on this material to see that it conforms exactly with the specifications. Very little variation of the coarser material is allowed and any deficiency in this respect has to be adjusted.

Inspection

This work is supervised by the Department of Public Works of the State of Nebraska aided by the govment. The State places a Project Engineer on the work, who is supplied with such assistants as he needs. He is required to lay out the work, secure samples of materials, and to be responsible for the inspection of the same. He makes a daily report to the Department of material and progress made. His work is also subject to inspection from time to time by the officials of the State and Department of Agriculture. He makes all measurements for estimates, and certifies the same.

In conclusion let me add that this work, though it represents a small part of Nebraska's road building program is being watched by engineers in the middle west with a great deal of interest for on the result of this work may rest the solution of the problem of cheaper pavements for some of the Central-Western States that have no suitable material for coarse and fine aggregate. The successful use of the Platte River deposit will have a great influence in extending hard surface road systems in Nebraska and adjoining re-

Book Reviews

The Model T. Ford car, its construction, operation and repair, including the Fordson Farm Tractor, the F. A. Starting and Lighting System and the Worm Drive 1-ton truck by Victor W. Page, M. E., 410 pages (5x7), 153 specially made engravings and two large folding plates. Price $1.50, sent prepared to any address on receipt of price. The Norman N. Henly Publishing Co., 2 W. 45th street, New York, N. Y.

Revised, Enlarged and Brought Up to Date—All New Ford Improvements Described

This is the most complete and practical instruction book ever published on the Ford car and Fordson tractor. A high-grade, cloth-bound book, printed on the best paper, illustrated by specially made drawings and photographs. All parts of the Ford Model T Car and Fordson Tractor are described and illustrated in a comprehensive manner—nothing is left for the reader to guess at. The construction is fully treated and operating principle made clear to everyone. Complete instructions for driving and repairing are given. Every detail is treated in a non-technical yet thorough manner.

This book is written especially for Ford Drivers and Owners by a recognized automobile engineering authority and an expert on the Ford, who has driven and repaired Ford Cars for a number of years. He writes for the aveage man in a practical way from actual knowledge. All parts of the Ford Model T Car and Fordson Tractor are described. All Repair Processes Illustrated and Fully Explained.

Hydrated Lime in Concrete

The National Lime Association, Washington, D. C., has recently issued the following pamphlets which they will gladly send to any of our readers, viz:—

No. 350—Economical Brick Mortar—gives, in concise form, the vital considerations in favor of using lime in brick mortar and is in effect a summary of our bulletin No. 300—Ideal Brick Mortar.

No. 351—In the Concrete Chute—summarizes the points in favor of using lime as a means of facilitating the handling and placing of concrete and illustrates this use in a large way on an important structure. It is an introduction to bulletin No. 303.

No. 352—Permanently Dry Basements—shows how lime acts as a water-proofing medium and cites several notable instances of this use. Bulletin 301 is a good companion to this

No. 353—Hydrated Lime in Concrete—gives much useful information regarding the proper use of hydrated lime in connection with building operations and will help in stimulating interest in its use in all classes of concrete work.

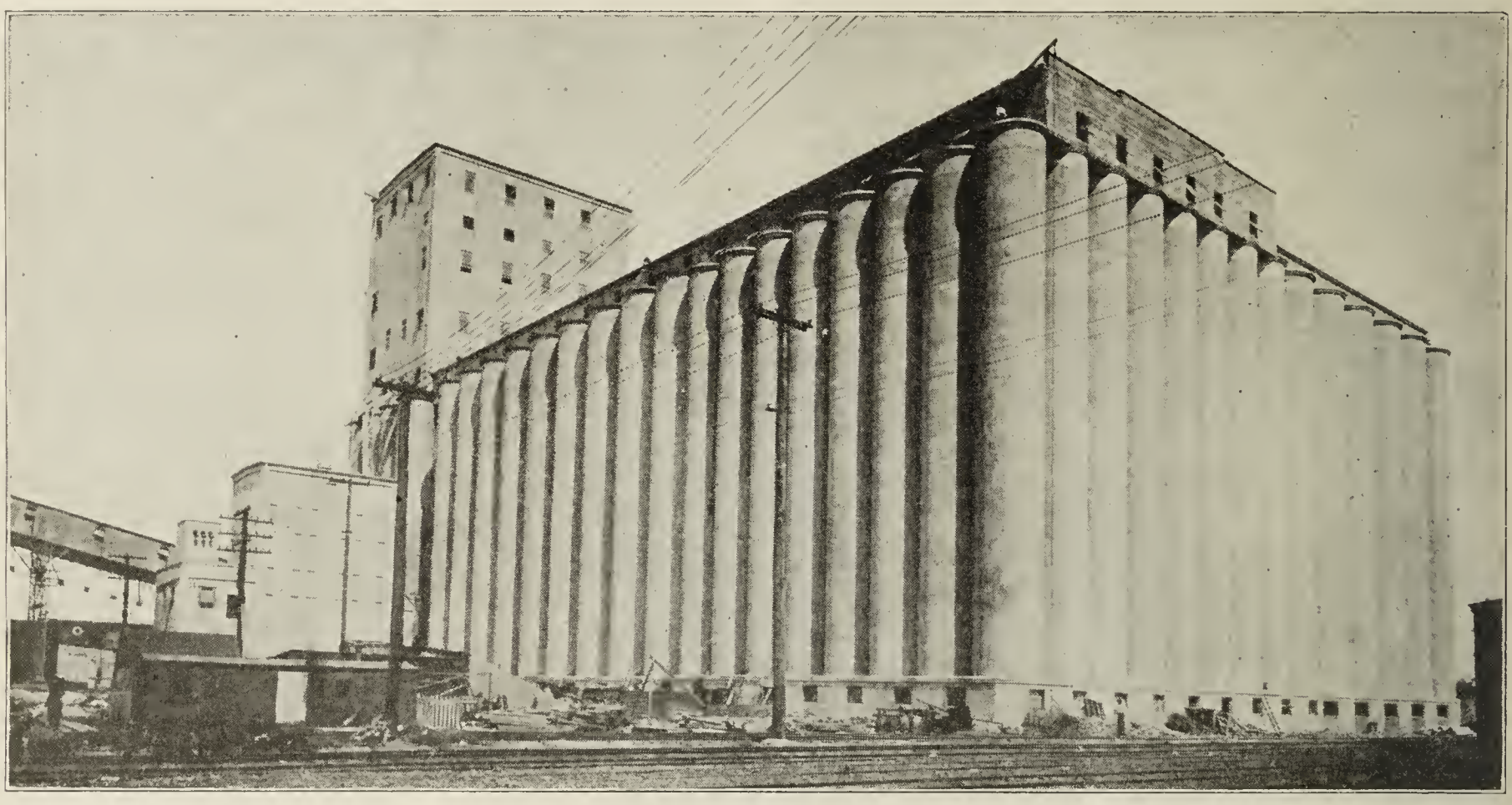
A Builder of the Nation's Granaries

W. R. Sinks, Known Far and Wide as the Father of the Modern Concrete Elevator

Those who consider themselves tolerably familiar with the subject are wont to call William R. Sinks the "father of the concrete grain elevator." William R. Sinks seems to be about the only dissenter. He modifies the statement to this extent.

"If you will call me the father of concrete elevator building with a slip form," he says, "I'll stand for it."

Inasmuch as practically every concrete elevator in these United States and the neighboring Dominion of Canada was built by the use of movable forms, Mr. Sinks seems to be drawing a pretty fine distinction, but on the other hand, he speaks from no mere acquaintance with his subject, but from a knowledge gained in 35 years of close association with it, so there isn't much to do but to accept his reservation.



A modern concrete grain elevator with a capacity of 1,100,000 bushels. Built at Philadelphia for the Pennsylvania Railroad by James Stewart & Co., under the direction of Mr. Sinks.

This article was meant to be the usual sort of biographical sketch, but Mr. Sinks wouldn't have it so. He was willing to talk concrete elevators by the hour, but dodged questions about himself. Luckily he has been so closely associated with the development of the concrete elevator that the story of one is the story of the other, so his modesty regarding his achievements fails in its purpose this time.

According to Mr. Sinks, the old wooden grain elevators were all right until they burned up, which they did with a frequency that was disappointing, discouraging and costly. The explosive character of the grain dust made them the worst sort of fire hazards and every builder was looking around for a satisfactory fireproof grain elevator.

It was in those days that Mr. Sinks, then about 22 years old, went to work for Barnett & Record, contractors of Minneapolis, specializing in building elevators. Born in Ohio, he had succumbed to the "Go west, young man, go west," of Horace Greeley, and at the conclusion of a visit to a sister in Wisconsin decided to go a little further West, selecting Minneapolis as his objective. Once there he engaged in the building business and it was at the conclusion of a season in which he had completed successfully a number of subcontracts for Barnett & Record that he was hired by that firm as its general superintendent.

Steel elevators were becoming fashionable about that time. Hailed as the solution of the fireproofing problem, they were built in great numbers until someone made an alarming discovery. True, the steel didn't burn, but if a fire came anywhere near a steel elevator its walls grew so hot that they set fire to the grain inside. The result of such a mournful incident is clearly shown in one of the photographs on the opposite page.

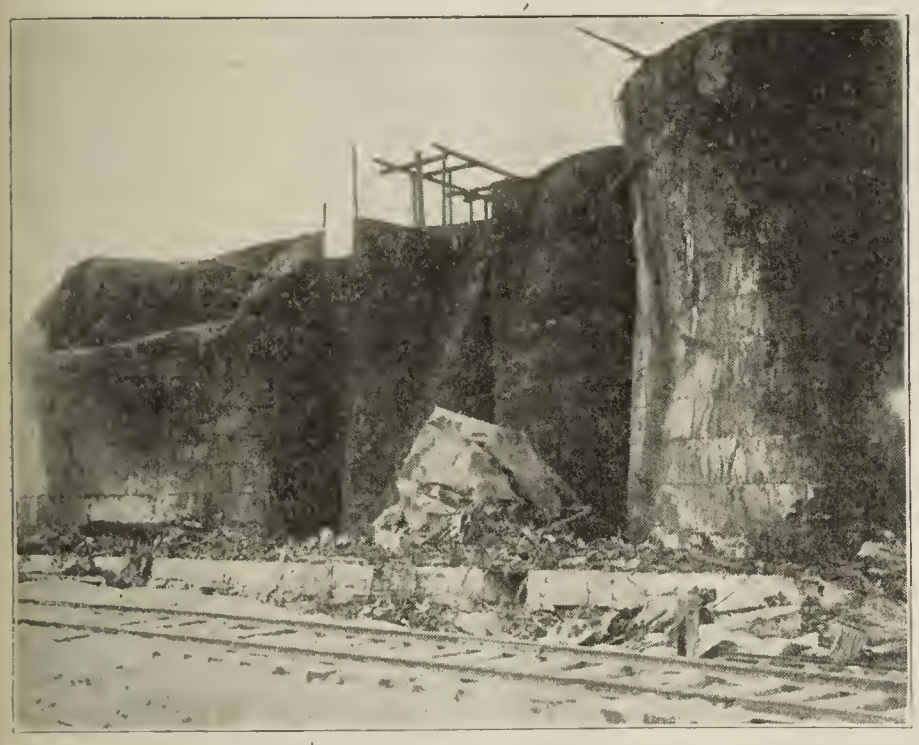
The ruin of the grain inside various steel elevators as a result of fires in the neighborhood spelled the doom of that form of construction and the elevator men began to look for something better. The tile elevator next was developed, a form of building which Barnett & Record specialized in for a number of years. The firm controlled the basic patents and after the first one put up in Minneapolis had proved successful, the demand for them became so great that about 15,000,000 bushels of elevator space per year were put up.

The great problem seemed solved so far as the firm of Barnett & Record was concerned, but others didn't think so. One of these others was a man named Haglin, who, according to Mr. Sinks, deserves the credit of being the first man to build a concrete elevator in this country. This pioneer of the modern grain elevator was put up in Duluth. It was built with fixed forms which were taken off and raised after the concrete had been allowed to set overnight. The result was an unsightly job with each joint plainly marked and with considerable offset every now and then. Unsightliness was not the only defect of the first concrete

elevator, for the first time it was filled with grain it burst open.

That was a black eye for the concrete elevator right at the start of its career, and if it hadn't been for a man named Henry, who was chief engineer of the Canadian Pacific Railway, that black eye might have kept the concrete elevator from coming into its own for many more years.

This Canadian engineer certainly deserves the title of godfather of the concrete elevator, "built with slip forms," to use the Sinks phraseology. His railway needed a half million bushel elevator at Port Arthur



What a fire across the street did to a steel grain elevator.

and it was his job to get it built. Several years before, while traveling in Central Europe, he had seen some small concrete elevators and had fallen in love with them. So when he began negotiations for the Port Arthur elevator he asked why it shouldn't be built of concrete.

Barnett & Record with their patented tile elevator tried to discourage him, but he was obdurate. Even

The first concrete elevator. It burst after being filled with grain.

a reference to the Duluth fiasco failed to move him and he asked that bids be submitted for three types of elevator, steel, tile and concrete. His wishes were law, so Barnett & Record proceeded to submit three bids, but before doing so "bethought themselves of a stratagem," as the Swiss Family Robinson always phrased it. Knowing from their investigations and data that a concrete elevator could be built for less than a tile structure, they calmly made a higher price for concrete than for tile. Mr. Sinks confesses to a part in this ingenious plan, but in the same breath admits he is glad it didn't work.

For it didn't. Mr. Henry looked over the bids, refused to let a little thing like a few thousand dollars worry him, and accepted the bid for the concrete grain elevator. That put things squarely up to Barnett & Record, and incidentally to Mr. Sinks. At this point, Mr. Henry contributed a most useful hint also gleaned from his travels. While on the other side of the Atlantic he had observed the construction of a concrete culvert on which movable forms were used which were drawn forward with a sort of capstan as fast as the concrete was poured. During a conference on the new elevator he told what he had seen. That was enough to start Mr. Sinks.

"If a movable form can be used on a concrete pipe lying on its side in an earth obstructed trench," he said, "why isn't it easy to make one that can be pushed up into the empty air as fast as we build our elevator?"

Convinced that the thing could be done, it didn't take him long to devise the movable form with its yoke and jack working on a steel rod set in the concrete which has been used ever since in one form or another whenever concrete grain elevators have been built.

The new device made the Port Arthur job easy, and the profit was about $30,000. That was finished about 1904 or 1905, and in the intervening years since, concrete elevators have gone up wherever there was grain to put in them. A 200-ft. elevator can be put up in 6 weeks and to the eye the walls will be as smooth as a cathedral column. All this, thanks to Father Sinks and the movable form, not forgetting Godfather Henry of the C. P. R. and the less fortunate pioneer, Haglin, whose relationship is a little harder to define.

Mr. Sinks remained with Barnett & Record for 20 years, finally becoming manager. Fifteen years ago he joined the James Stewart contracting organization as head of its grain elevator department. In the 35 years he has been in the business he has built on an average of 5,000,000 bushels of elevator space per year and is still at it. Just at present he is full of enthusiasm over the big elevator for the Pennsylvania railroad at Baltimore, which will be finished this month.

"It is one hundred years ahead of the times," is the way he describes it, and he ought to know.—"Successful Methods."

Announcement

The Austin Machinery Corporation, whose capitalization is $35,000,000, announces the consolidation of the F. C. Austin Machinery Co., Inc., Linderman Steel & Machine Co., F. C. Austin Drainage Excavator Co., Toledo Bridge & Crane Co., Municipal Engineering & Constracting Co., and other large manufacturers of kindred lines with plants at Toledo, Ohio, Muskegon, Mich., Wnithrop Harbor, Ill., and Woodstock, Ontario.

The combined energy and capacity of these organizations will be devoted to mass production and to supplying the most complete line of earth-moving and concrete-mixing machinery to meet an unprecedented period of construction, good road-making, reclamation, excavation and irrigation.

Distribution points will be extended throughout the world to facilitate the service and distribution of this broad line of contractors' requirements.

Some Points on Construction of Concrete Tanks

By L. J. Mensch, Contractor, Chicago, Ill.

There are a number of points about the building of concrete tanks for storing oil that are very important. Especially should those who have not done this class of work before be sure to look into these points carefully.

FIRST, IS THE MATTER OF DESIGN. In cannot be said too strongly that the greatest care must be taken in the designing. It is better to follow lines of successful practice rather than to try out something new and, if possible, have somebody with large experience in tank design do the designing.

There are a number of secondary stresses set up by the pressure of the liquid on the walls. In an ordinary building an architect might neglect to take care of these stresses and there only would small cracks develop, the load being carried by the main reinforcing. These cracks would be filled up by the plasterer or by the next decorator.

Not so with the oil tank. Oils will find the least tiny little crack and seep through, and you have a leaky tank on your hands.

Freedom from Joints Essential

The place that especially needs to be watched is the joining of the walls to the floor. Get a sub-grade that won't settle, or if it settles at all, one that will settle uniformly, then a reinforced floor 6 in. thick will be all right. But at the edges of the floor, say, beginning 5 ft. from where it joins the wall, the reinforcing must be greatly increased and turned up into the walls at the proper sides, to take care of the secondary stresses, and it is well to gradually thicken the floor near the walls to, say, 12 in. or 24 in., if the walls are high.

In my work I usually try to complete the floor at one pouring, and the walls in a second continuous pouring. This makes only one joint. It is these joints that are most apt to give trouble and the fewer of them the better.

Proper Ways to Make Joints

Several ways of making these joints have been tried, one of which is the use of a metal dam, which is simply a piece of sheet metal, say, 6 in. wide placed vertically, buried 3 in. deep in the old concrete and extending 3 in. into the new concrete, which will prevent the most serious leaks. I do not use this, however, but just finish my joint square. When ready to proceed with the concreting, this old surface is thoroughly chipped with a pick, cleaned, and wet down. Then we place all along a course of 1:1½ mortar about 2 in. to 3 in. thick. This is made fairly wet and imediately upon it is placed the concrete. We make this what would be called a mushy consistency of 1:1:2 mix.

Dense Concrete Is Required

In the laboratory a 1:2:4 mix will make a tight concrete, but after a great many years' experience I have found that under actual working conditions a 1:2:4 mix means there will be spots in the wall of about 1:1:2 mix and other spots of a 1:3:6 mix, and the tank will leak in these spots just as surely as if the whole wall were of 1:3:6 concrete. It pays good money to play safe. It may take $30 more of cement, but the chances are mighty good that it will save paying out $300 to repair the leak.

Spading Concrete Is Best

We do not tamp the concrete, but stir it usually with 1x2-in. sticks. The coarse aggregate which we use runs from ¼ in. to 1 in. in size. Our specification for consistency would be just sufficient water so that tamping will not be required, but spading will make the concrete flow around the reinforcing.

Faithful men on the spading job are very important. The man who stops to make a cigarette while two or three cartloads of concrete are dumped is not the one for his place. Where we have five men wheeling, we have at least three men who do nothing but spade the concrete.

Save on Forms—Not on Cement

Some people seem to have trouble with getting the tanks waterproof. The cure for this is to put in enough cement. Try saving on the forms instead of the cement. On every job of this kind the forms cost five times as much as the cement and there is a great deal more waste than necessary.

What You Owe Yourself

To sum up these points. Be sure your design is all right. Have it checked over by someone else who knows. A faulty design will mean a leaky tank and the contractor will be held for it. Be more watchful in your supervision in this than in any other reinforced concrete work. Employ conscientious, faithful men whom you can rely upon.

Concrete Oil Tanks Are Permanent

With proper care a concrete oil tank can be built that will be just as satisfactory as a concrete sidewalk. But don't forget to use enough cement. It hurts us all when some contractor builds a tank that leaks. Cement is the cheapest and best waterproofing that is known today.

Book Reviews

Concrete-Steel Construction. Part One—Buildings. A Treatise upon the Elementary Principles of Design and Execution of Reinforced Concrete Work in Buildings. By Henry T. Eddy and C. A. P. Turner. Second edition. C. A. P. Turner & Co., Minneapolis, 1919. Cloth, 6 x 9 in., 502 pp., illus., tables.

The authors of this volume believe that the fundamental principles underlying the theory of reinforced construction are not generally understood by engineers and the methods of computation of applied bending moments in common use are erroneous. Their book presents what they believe to be the correct analysis of the bending and twisting moments present in columns and flat slabs, a method founded upon the manner of distribution and of the vertical shears that transmit the leading to the supports.

Waterproofing Engineering. For Engineers, Architects, Builders, Roofers, and Waterproofers. By Joseph Ross. First edition. John Wiley & Sons, Inc., 1919. Cloth, 6 x 9 in., 452 pp., 140 illus., 41 tables.

The absence of any systematic treatise on waterproofing has led to the preparation of this book, which is based on the author's practical experience and researches, as well as his study of the existing literature. The function of waterproofing, the systems in use, methods, and results are described and specification and cost tables are given. A useful glossary of waterproofing terms and a bibliography are appended.

Gravel Is Nebraska's Buried Treasure

Buried treasures! What a mysterious sounding phrase, says the Nebraska Monthly Report, and yet there are unlimited buried treasures in Nebraska. Some suggest "hidden resources" or "undiscovered possibilities," but we venture to say few know of the buried treasures found in banks, stream beds and river beds in the state. Gravel is Nebraska's buried treasure!

Several months ago the state highway department announced that trucks received from the War Department would be used in hauling gravel from gravel pits which were to be opened at various places throughout the state. These pits have been opened, and two of the best equipped are now in operation at Grand Island and Wood River.

Hall county built 32 miles of improved earth road at 30 cents a yard. A new project has been made of this federal aid road and calls for its surfacing with gravel obtained from a pit a few blocks out from the business center of Grand Island. Trucks can be seen hauling heavy loads of the best kind of gravel for road surfacing found anywhere in the state. The discovery of this gravel will prove beneficial to hundreds of people who drive automobiles and horses over Hall county's federal aid road.

The camp at Grand Island is one of the largest and best equipped in Nebraska. Just how the gravel is obtained and the method used in spreading it on the road are of paramount interest.

Camp Site Accommodates 25 Men

Camp No. 1, at Grand Island, consists of three buildings, a foreman's house, a large bunkhouse and a mess hall. The structures are not unlike army structures, although built on a much smaller scale. The sleeping quarters accommodate about 25 men, and incidentally, the bunks are a close second to Pullman sleepers, for the men recommend them for comfort, ventilation and sanitation. Both of the camps have modern conveniences, such as electric lights and hot and cold water.

At the Wood River camp water is pumped into a 600-gal. tank, which in turn supplies the entire camp.

Fifty men can sit down at one time at the long rows of tables in the mess hall. At one end is a kitchen in which an enormous stove stands. If one were to half close the eyes, he could easily imagine 25 or more golden brown flap-jacks calling for "turning attention." The entire camp is characterized by cleanliness and a business-like atmosphere.

How Gravel Is Dredged

The first sound heard is the put-put-put of the dredging pump, dredging sand gravel from a small lake bottom 200 ft. from the camp. A 25-hp. oil engine is operated.

Camp No. 2, at Wood River, also uses a 25-hp. oil engine. Both camps use the pump, 600 r.p.m., with 6-in. suction and 6-in. discharge. No. 2 also uses 7-in. discharge, suction being about 25 ft. at each camp. No. 2 pumps against 15-ft. head, while No. 1 has 34-ft. head.

Output from 80 to 200 Yd.

The engine is located on a boat structure, built of three separate longitudinal sections, about 15 by 18 ft. and nearly 3 ft. high, the present water displacement averaging 20 ft. Both engines are equipped with 1½-in. centrifugal pumps for cooling and priming. The dredge sucks the water and gravel from the bottom of the lake, carries it through a pipe 80 ft. in length and there is thrown on a screen. The fine sand is separated and slewed off from the coarse gravel, the latter dropping into a bin. The bin capacity at the Grand Island camp is 26 yd., the daily output averaging somewhere near 80 yd. At the Wood River camp the yardage will average 200 or more.

Gravel Better Than Specifications

Gravel obtained from this pit is running better than called for in the government specifications. First rough tests taken at the Grand Island pit show 12 per cent gravel retained on a No. 4 screen, 40 per cent retained on a No. 6 screen, and 65 per cent retained on a No. 8 screen. The gravel is screened over a No. 8 screen set adjustable for pitch and length, to control screen percentages.

The bin at Grand Island is being reconstructed on the ground, with the hoped-for result that the output will be trebled by reducing the overhead. A belt conveyor will be used to load from the bin to the motor trucks with a carrying capacity of 1½ yd. These trucks are equipped with hydraulic hoists and end dump and are proving their excellence in handling the surfacing material.

At the Wood River camp the loading is done with wagon loader, operated from the storage bin on the ground, which is of unlimited capacity.

Clay is loaded by a 120-ton tractor which pulls an elevating grader. It is loaded directly on motor trucks and hauled to the road, where it is spread 1 in. deep over a 4-in. layer of gravel. After it is spread a thorough discing and harrowing takes place.

At the time of the county fair 1,200 ft. were completed, which stood up very well under extremely heavy traffic.

The pump at Grand Island camp operates 12 hours daily and keeps 6 trucks busy. When the output is doubled 12 trucks will be required to haul the gravel. At the Wood River camp it is expected that 20 trucks will be necessary, as the pump will run day and night.

A Handy Blasting Machine

There are several practical reasons why charges should be fired by the electric method. The blaster is at a safe distance from the shot when he fires it. He can time the blast to the second as no time is lost waiting for fuse to burn. Hang fires and misfires are practically eliminated. For blasting in wet work the electric method is more reliable. By firing several shots simultaneously the maximum effect of the explosive is obtained. One charge helps the other and less

Davis No. 1 Blaster. Showing Separate Operating Handle.

explosive is required than when the charges are fired by cap and fuse.

To meet the needs of the comparatively small user of explosives, such as the farmer with stumps to blast, the contractor who finds it necessary to loosen the ground before starting excavation or the concrete products manufacturer who operates his own gravel pit or quarry, Atlas Powder Co., Philadelphia, Pa., is marketing the Davis No. 1 blaster.

This is a small, light-weight blasting machine only 2 ins. by 4 ins. by 4½ ins. and weighing but 3¼ lbs. The outer case is a seamless brass tube, heavily nickeled with aluminum top and bottom plates. The machine is substantially built to stand hard service. A removable leather strap makes carrying easy.

The Davis No. 1 blaster is very powerful for its size, developing ample current to fire five 30-ft. copper wire blasting caps connected in series. An important safety feature is the detachable handle. This is, in fact, a separate part of the machine and may be kept in the possession of the shot-firer, preventing the operation of the machine by any other person.

Detonators for Blasting

By J. B. Stoneking

Best results with explosives are dependent, in large measure, upon a thorough understanding of the use and function of the various detonators and, particularly, of the proper adaptation of detonator to explosive. What detonators are and what they do is explanied, authoritatively but clearly, in Mr. Stoneking's article.

The idea that all explosives are dangerous and liable to explode with disastrous effects upon the least provocation seems to be firmly rooted in the minds of the general public, and this feeling of fear is, of course, better for the general safety of mankind than that of absolute disregard of the sensitive properties of high explosives. The regular user of explosives, however, must know a great deal regarding the sensitiveness of the particular high explosive he is using in order to get the full power from it and make it work for him at its highest efficiency.

The great power contained in high explosives, by virtue of which they rend and shatter even the hardest and toughest rock and thus make possible the great engineering and construction achievements of man, would not be available were it not for the activities of the little detonator commonly known as the blasting cap. Among many blasters who work with and handle explosives daily, too little is known about detonation, and even scientists and chemists who have spent years in experiment and study are not able fully to explain the phenomenon. However, long series of investigations have been conducted and many thousands of tests made which, though sometimes ending in serious accidents, have thrown considerable light upon the subject.

A simple explosive like black powder releases its full power by burning only, while the complex high explosives, like nitroglycerin, picric acid, dynamite, trinitrotoluol (T. N. T.) and guncotton, do not. For instance, dynamite, when simply ignited in the open air, will, if not disturbed, burn quietly with a large amount of smoke and fumes; if strongly confined, it will partly though weakly explode and partly burn with considerable smoke; but, if given a quick, heavy shock like that from a blasting cap, the explosion is strong and there is almost no smoke.

This last effect is called detonation, and it has been found that the more complete the detonation, the greater is the power obtained from the dynamite. Several theories, which are difficult to understand and leave much to be desired, have ben advanced regarding detonation and its causes. Some insist that the almost instantaneous breaking up of the solid compounds into their chemical elements and the recombination of these elements into gaseous compounds is simply due to enormous mechanical pressure momentarily applied and accompanied by great heat. Others maintain that the action is one of vibration, which sets up waves or impulses, and that these waves must be of certain length and intensity to secure the best results. As an example of the latter, the familiar hollow glass ball experiment used in physical laboratories may be cited. This ball will withstand rather severe blows without breaking, but the vibration of a certain musical note near it will shatter it into pieces, while the vibration of a lower or higher note will not affect it. That there may be some foundation for both of these theories is shown by a number of experiments with different detonating substances or agents and their effect on high explosives of various compositions. These experiments have, from time to time, been carried on by the governments of different countries, the United States Bureau of Mines, private investigators and manufacturers of explosives.

As all high explosives at present in use, when manufactured so as to be safe for transportation and ordinary handling, require an intermediate agent to give them the initial shock for complete detonation, vari-

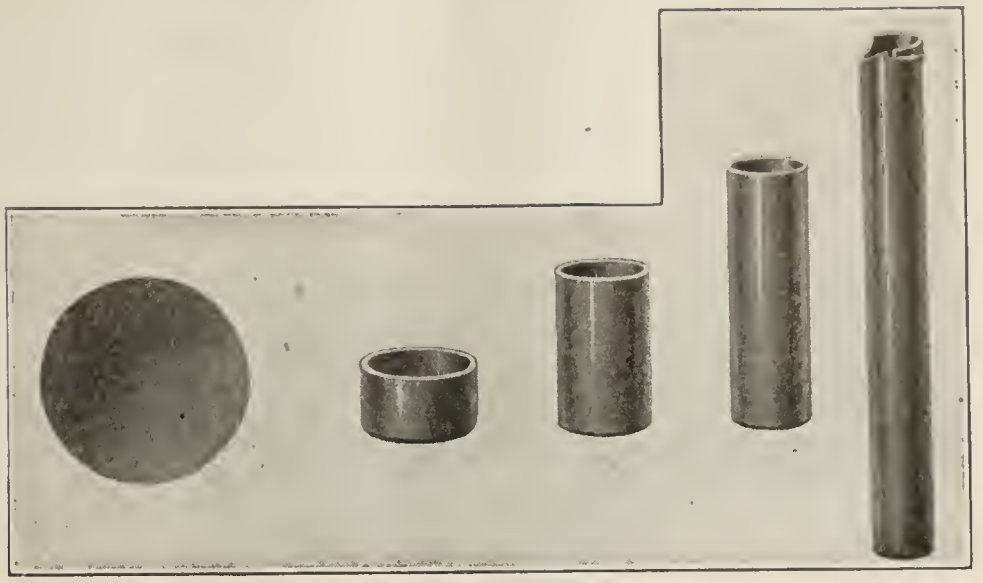
ous highly explosive substances have been developed for this purpose. Among those detonating agents that have proven of sufficient value to be developed commercially may be mentioned fulminate of mercury, chlorate of potash, dry guncotton and lead azide.

That the efficiency of any one of these agents depends upon the particular high explosive with which it is used, has been shown quite conclusively by numerous experiments. For instance, less fulminate of mercury is required for detonating T. N. T. than for tetryl, while more lead azide is required for T. N. T. than for tetryl. This shows that fulminate is more efficient for T. N. T. than it is for tetryl, while lead azide has more effect on tetryl than on T. N. T. Again, silver azide is more efficient for picric acid than than for guncotton, while fulminate of mercury acts with greater effect on guncotton than it does on picric acid. From this it will be seen that a given detonating agent does not possess the same efficiency for detonating all explosives. The manufacturers of all kinds of high explosives and dynamites recognize this fact, and accordingly make tests of blasting caps and electric blasting caps containing different quantities and mixtures of detonating compounds, in order to secure the agent which will give the greatest efficiency for use with their particular brands of explosives. Such being the case, it often happens that the detonators and blasting supplies placed on the market by one manufacturer, while giving excellent results with explosives of the same manufacturer, will not do so well with explosives of another manufacturer, owing to a difference in the explosive ingredients. Hence, it is generally of advantage to the user of dynamite and similar explosives to purchase detonators of the same manufacturer. This should not only give greater efficiency from the explosives, but will enable the user to properly place the blame should any of the materials be defective.

Formerly, with the old-style Kieselguhr dynamites, the detonating agent used was fulminate of mercury alone, and blasting was made stronger or weaker by varying the amount of fulminate. Thus a standard scale of strength was established, which still remains for the comparison for blasting cap strengths. Later it was discovered that something more than mere strength was needed, which, for want of a better definition, might be called vibration frequency, or wave length, to properly detonate the modern, more complex explosives with their various ingredients. Blasting caps and electric blasting caps nowadays consist of mixtures of various detonating agents, in order to secure this effect, but are still graded and compared in simple strength similarly to the old cap containing fulminate alone.

The detonating substances are very much more sensitive than the explosives with which they are used, hence their manufacture is attended with greater risk, and the most minute attention must be paid to safe processes and safety rules. Many of the agents experimented with are so sensitive as to preclude their manufacture on a commercial scale, some exploding violently upon merely touching them, this characteristic naturally prohibiting their use.

Manufacturing the small copper shell, or container, to receive the detonating composition is a very interesting process. The copper is received in sheets and placed under a punching machine, which cuts small circular discs from the sheet. These discs then pass into another machine which has a descending plunger



that cups the flat disc. From the cupping machine the cups are conveyed to a drawing machine, which cups them still more and starts the formation of the shell. After passing through two more drawing machines, the copper is further drawn out and the shell formed with a rough top. This rough top is cut off smoothly in a cutting machine, and the shell is complete. The shells are then dumped into hoppers from which, by pulling a lever, the operator can load them, 100 at a time, into block trays having holes, into each of which a shell fits in an upright position, ready to receive the charge of detonating substance. The preparation of the different detonating agents is a rather intricate chemical process, and is attended with infinitely more danger. As an example, fulminate of mercury is made by mixing nitric acid, mercury (quicksilver) and alcohol in the proper proportions. A white residue, or precipitate, called fulminate is the result of this chemical action. This fulminate is carefully washed to remove all impurities and excess acid, placed while still wet in small fabric bags, and stored in wells in the ground filled with water.

When wanted for use, the fulminate is removed from the water, taken to a barricaded dryhouse, where gentle currents of warm air remove the moisture. Dried fulminate is very sensitive, hence the handling from this point must be done with extreme care. The dry fulminate is carried in small rubber-lined boxes to the dry-storagehouse, located at a considerable distance from the rest of the plant as a safety measure. From the dry storage, the fulminate is taken in small quantities to the mixing house, where it is mixed with the other detonating ingredients in the correct proportions in automatic, specially constructed vibrating machines.

The mixed fulminate is then taken to the house, where it is filled by automatic machines into the copper shells held in the trays, and then to the press, which has 100 small plungers that fit exactly into each cap or shell. This gently presses the detonating mixture, and compresses it to a sufficient degree to keep it in the shell. Explosions are frequent in this step of the process, hence the press is surrounded by very thick walls, and the operator remains outside during the operation.

From the press, the loaded caps are conveyed in sawdust to rumblers and screens, where any loose particles of the detonating agent are removed along with the sawdust, and the blasting caps are ready to pack. They are first placed in felt-lined tin boxes, each holding 100 caps, then into heavy pasteboard cartons, and finally into strong wooden cases ready for shipment to any point where man may require their aid in his undertakings.

The Successful Application of Rubber Belting in the Cement Mill

By R. W. Ford

In these days of increasing efficiency and production the belt problem is coming in for its share of consideration among the industries of the country. More and more attention is being given transmission and belt overhead, and the value of service and the applying of belts, according to engineering principles, is being appreciated as never before. There is a right belt for every installation—and when this thought is remembered in buying belts—satisfactory and efficient operation is bound to increase, and the overhead cost to drop.

In no class of industry can the value of service be demonstrated better than in the cement mill, where large crushing and grinding machinery and methods of conveying bulk materials from one unit to another, call for an enormous use of belt in the course of a year

Every plant and mill has its belt problems and trouble, but belt operation in the cement mill probably covers as great or greater variety of hard and exacting conditions as in any other industry. Where such an enormous percentage of the overhead is charged up every year against belt operation, considerable care and thought must be given to the purchase and application of belting, or else many dollars will be lost yearly through misapplication and consequent loss of production. To insure and protect the customer's best interests along these lines, every belt representative should be, not only a salesman, but a sales engineer, able not only to sell his product, but to recommend and apply it in the right place, and to be able to do this, of course, he must be thoroughly familiar with the belt operation in his customer's plant or mill. These sales engineers in turn should be reinforced by an efficient engineering department, to whom they can refer in any emergency or for plant analysis work.

There was a time, several years ago, when considerable rubber belt was sold to the cement trade, but it was of inferior quality, and proved so unsatisfactory in service, that it was literally thrown out, and leather continued to predominate for transmission and canvas for conveyor work. This was the natural outcome from belt being sold to meet a price rather than a service condition.

It has not been, until recent years that any effort was made to cash in on the tremendous possibilities in this field, on the right basis, namely: by selling and applying the right belt in the right place. Although it took some time to remove the bitter taste left by the inferior rubber belt of the past, the trade gradually began to form a new opinion of rubber belt, as sold along this basis of service, and to see the advantages and benefits to be derived from analyzing belt conditions, either individually or collectively in the form of plant analysis. Today, in its varying construction, rubber belt is without a doubt recognized and accepted as the most versatile type of belt on the market, having a number of qualities and advantages under dusty or atmospheric conditions, that other types of belt do not have. General results have been phenomenal, and wonderful records can be produced, showing the actual results obtained from popular brands of rubber belts on some of the hardest kind of installations, such as all styles of crushing drives, including gyratories, and the huge Edison Giant roll; also tube mills, generator, Lenix, elevator, pan, kiln, dryer, vertical Griffin and Fuller mill drives, and many other types of installations where destructive agencies, such as dust, heat, small pulleys, intermittent loads, high speeds, etc., help to shorten the life of a belt.

Turning from the transmission to the conveyor possibilities in the cement business, here again we find rubber belt playing a prominent part. Here again we find the analyzing of conditions very essential, in order to assure a belt that will show the lowest ultimate unit cost per barrel or ton of material conveyed, which might be almost any size or temperature of stone, clinker, cement or coal. All conditions should be carefully taken into consideration before making what is called a well-balanced recommendation. The construction and specification of this belt should be such that its component parts will wear out as nearly together as possible. In other words, it is false economy to apply a belt designed to carry coal, on a clinker installation, or a belt for crushed stone on a cement installation. Likewise, a belt can contain too many plies and too light a cover, or vice versa.

A great many times the wear and tear and abrasion on the pulley side of the bet is as great as on the carrying side, and yet this condition is very often overlooked and a belt is applied without enough protection on the pulley side. This condition particularly exists sometimes where small or fine material is carried in very dusty atmosphere. The dust and grit get between the return side of belt, and the idlers and pulleys, grinding that side of the belt, often faster than the top side is wearing out. The tendency for wet material is also to creep around on the under side of the belt.

There is one very important point that purchasing agents and superintendents should consider, in connection with this present day method, of buying and selling belts, and that is that every manufacturer's goods are different in character and construction, although possibly similar in appearance, and that each manufacturer builds several different grades of belt, selling at a wide range of prices. This being the case, how can a concern get the most for its money, unless the seller is thoroughly familiar with the customer's operating conditions.

An excellent illustration, with which the writer happens to be personally familiar, demonstrates the point very nicely:

An order was received from a large concern, specifying delivery of several belts to their plant. One of these orders, called for so many feet of one of their popular brands, the size to be 20″ 10 ply. Before entering the orders, the salesman checked up the belts with the analysis reports, which had been made of each plant, and found that this particular belt in question was to drive a No. 10 gyratory crusher and that the belt then on was a 20″ 10 ply canvas belt. The report also showed that the face of the crusher pulley was only 18½″ wide. There was the folly of a 20″ belt.

Now, then, the report also showed that the peak horse power required for the kind of stone being crushed was not over 175 H. P. leaving a 50% factor of safety. Investigation showed that a new superintendent, unfamiliar with the report, had requisitioned the belt on precedent; because the last belt was a 20″ 10 ply, the next one was ordered accordingly. The matter was brought to the attention of the purchasing

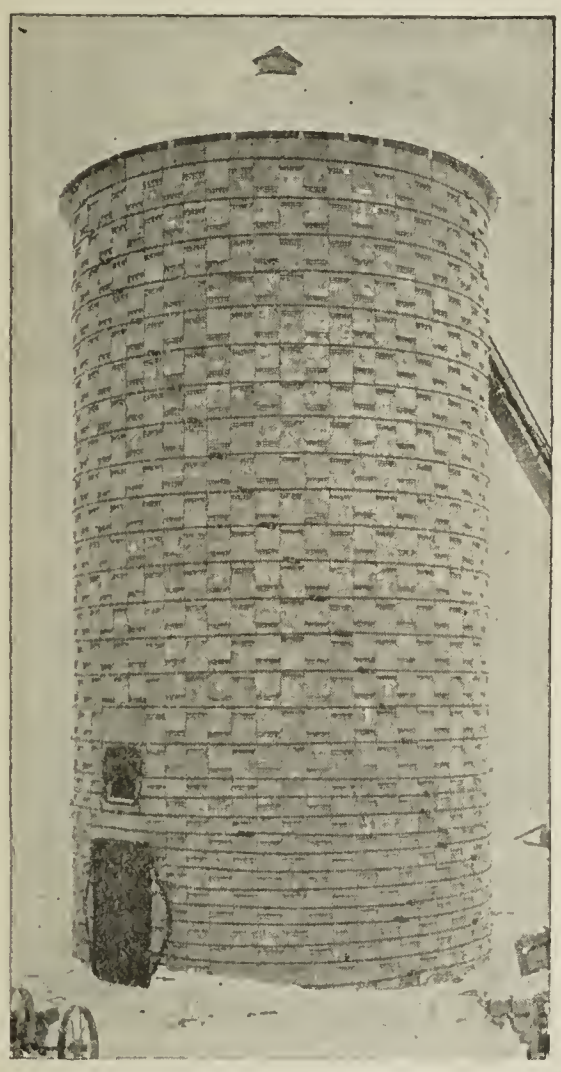
department, the order changed, and an original saving on that one belt, effected of about $125.00.

While some cement men who read this article may grunt and say their plant do not and would not use rubber belt, the above statements, applied to the business as a whole, and an investigation will only tend to prove the efficiency and economy of rubber belt, and the enormous and wide-spread demand that has sprung up as the result of practical, up-to-date methods of selling and application.

New Types of Concrete Corn Cribs

Mother Necessity of the ever growing Invention family is responsible for the development of several satisfactory types of concrete corn cribs.

The most recent of these is now being manufactured by J. H. Irey of West Liberty, Iowa. For several years Mr. Irey has been manufacturing cement stave silos, and his corn crib has been developed along similar lines.



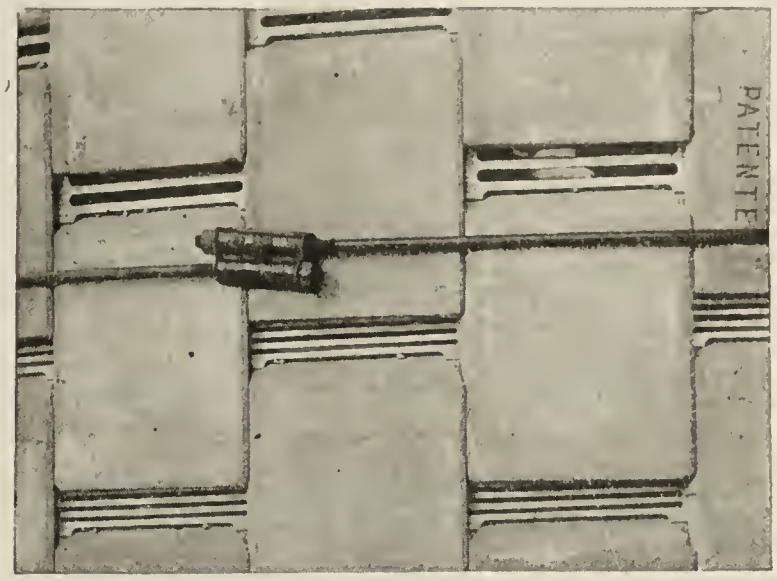
Irey cement stave corn crib on the farm of W. W. Walters, Wiota, Iowa —a fireproof, ratproof, and permenent structure.

White cement vase.

As may be seen from the illustrations, the Irey crib is built of short interlocking concrete slabs between which are metal gratings. At the center of the crib is a ventilating flue, from which radiates six lines of 4-inch tile laid in the floor. This flue together with the openings in the wall assures ample circulation of air through the stored corn.

The staves are 10 inches wide, 11½ inches long and 2½ inches thick, with ends beveled about 45 degrees to shed water. The metal gratings are held in place by slots in the edges of the staves and are 3½ inches high and ⅛-inch thick. This makes the combined height of stave and grating 15 inches. To keep out rats and mice, the openings in the gratings near the bottom are smaller than those at the top. The cost of this type of crib is reasonable, and those already built are giving satisfactory service.

Several other methods of building concrete cribs have been described in previous issues of CEMENT & ENGINEERING NEWS.



Irey cement stave corn crib construction combines permanence and ease of operation with ample circulation through the contents.

The monolithic silo contractor also can build corn cribs by using silo forms. Openings for ventilation must be provided in the walls, however. A crib of this kind 30 feet in diameter and 40 feet high with a capacity of 10,000 bushels of ear corn was recently erected by the Co-operative Elevator Co., of Farmersville, Ill. Building tile placed in the outer wall and in the flue which runs through the center of the crib give sufficient ventilation.

These several successful methods of construction give every rural contractor an opportunity to take advantage of the large demand for better corn cribs. Every corn belt farmer is a prospect for a concrete crib. They insure permanence, fireproofness, and protection against rats and mice so lacking in most cribs.

White cement building trim.

Concrete Garden Furniture

William Danmar of Jamaica, N. Y., is an artificial stone manufacturer who has made an unusual success with the manufacture of concrete garden furniture. He also makes a specialty of decorative stone work for use in mantels, fireplaces and exterior building trims.

Mr. Danmar markets his products under the trade name of "Danstone."

Significance of Cracks in Reinforced Concrete Construction

The cracks that occur in reinforced concrete can in general be classed under five heads:

(1) Cracking due to construction of concrete in setting; (2) cracking due to expansion and contraction caused by temperature changes in the concrete; (3) cracking due to too early removal of forms; (4) cracking due to overloading of the structure; (5) cracking due to settlement of supports.

Shrinkage of concrete in setting varies from 0.15 per cent to 0.2 per cent of the length for neat cement, and from 0.03 per cent to 0.05 per cent for concrete poor in cement. The poorer in cement a given concrete may be, the less shrinkage there will be. The increase in tensile strength obtained by the addition of extra cement is neutralized to some extent by the increased possibility of contraction cracks.

This is a point which should be borne in mind when designing structures to hold water or other liquids. In these structures all the tensile stresses should be taken by the steel, and it is of the greatest importance to have a concrete which is dense and not liable to contraction cracking. A 1:2:4 concrete, made of properly-graded materials, will be sufficiently strong and dense for most tank work, and is likely to develop less contraction cracks than a richer mix.

Cracking frequently occurs through expansion and contraction, due to temperature changes, especially in those parts of the structure which are exposed to the sun and weather, such as roofs and external walls.

A great deal of this cracking can be minimized by the adequate provision of temperature steel, but within limits a certain number of minor temperature cracks are inevitable, and should be recognized as inevitable. They are unsightly, perhaps, but as a rule do not affect the strength of the structure.

Removal of forms too soon produces cracks in floors and weak spots in walls. In the cases of floors, if the forms are removed too soon slight settlement occurs, and the soffits of beams and the slabs develop fine hair cracks. In the case of walls there may be no visible sign of any injury, but they often divide at places in their thickness, which may be ascertained by tapping them with a piece of wood or metal, when the hollow sound produced is evidence of the result. Cracking due to this cause should never occur if the job is properly supervised.

Overloading the structure or considerable settlement of supports produces the most serious cracks; in fact, they are usually the only kind of cracks of any considerable moment occurring in concrete structures. Cracks due to this cause usually occur as fractures in columns or as diagonal fractures in main or secondary beams. If such cracks occur, steps should be taken to remove the load and to strengthen the members affected. Sudden failure is not likely to occur immediately on the appearance of such cracks, as beams and columns generally will carry a lot more load after the first appearance of cracks, before final failure takes place. The appearance of these cracks, however, is often an indication that the member is overstrained.

All masonry structures, including reinforced concrete will develop cracks. Structures of masonry, stone, or brick, are discontinuous and jointed. The cracks in them due to any cause are dissipated, spread over innumerable beds and joints of the construction. In a reinforced concrete structure built as a monolith, without beds or joints, the same reasons for cracks exist, but the cracks are very apt to concentrate themselves in well defined and ugly openings, especially so if the steel reinforcing is not sufficiently and properly disposed. The cracks in concrete, due to the same causes as those in ordinary masonry on account of their prominence are all out of proportion to their significance. Such cracks as a rule do not affect in the slightest degree the stability of the structure, and are no greater in their totality than the numerous smaller cracks to be found in the joints of any brick or stone structure.

In a properly designed and constructed reinforced concrete structure there should never be serious cracks in the main structural members, and any cracks in the slabs supported by them are generally quite trivial, from the point of view of structural significance. Much worry would be saved by many architects and engineers if this were recognized and frankly accepted. It is useless to promise to erect a large concrete structure which shall be free from shrinkage and temperature cracks. Much can be done to minimize these cracks, but they cannot be entirely avoided.

*From the proceedings of the Royal Victorian Institute of Architects.

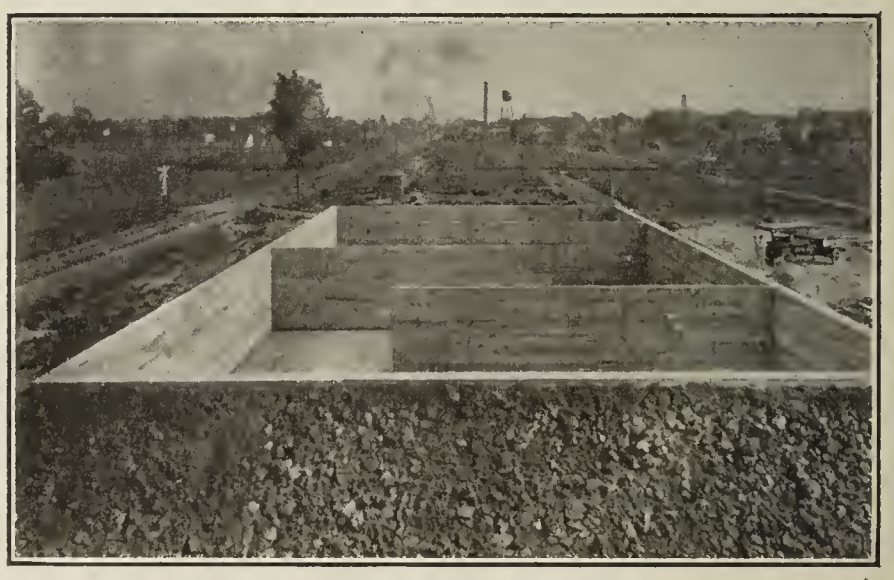
SULPHUR WATER STORED AND AERATED IN CONCRETE TANK

The illustration below shows an interesting tank which we recently completed for the H. J. Heinz Company at Bowling Green, Ohio, writes C. E. Finch.

The water used in this vicinity comes from deep wells and is heavily laden with sulphur; so much so that it cannot be used without treatment. To remove the sulphus, the tank as shown here was built.

The baffle walls are designed to maintain a constant and uniform flow through the tank and this flow, in connection with the use of an aerator, will allow the sulphur fumes to escape into the air. The posts near the Northwest corner will support an aerator. The pipe shown near the Southwest corner is an overflow under which is placed the outlet.

The tank is one hundred feet long, sixty feet wide



and twelve feet deep. The footings of the walls extend one foot in an are coated with a quarter inch of the lake asphalt, upon which rests the concrete floor.

We used a mixture of 1:1½:3½ and no waterproofing was added. The reservoir was constructed throughout of concrete and upon test, the tank was found to be entirely water-tight.

The contractor is very well satisfied with this kind of arrangement which has been used successfully on previous jobs. It is entirely satisfactory, not only for providing storage space and economical handling of materials, but also allows proper heating so that concrete work can be successfully carried on during the severe winter months.

Excavating a Mountain of Rock

Millions of Yards of Hard Rock and Ore Excavated by Twenty-one Steam Shovels Digging Eighteen Successive Terraces

The Copper Queen Mine of the Phelps-Dodge Corporation at Bisbee Arizona, consists of about 10,000,000 yards of very hard rock and ore forming Sacramento Hill which is an igneous mass of monzonite-corphry located between the ports of Bingham Canyons.

The rock and ore are being removed from the surface for a height of 1,600 feet by steam shovels operating in 18 successive terraces from 40 to 250 feet wide, average 100 feet, and with height of 60 to 120 feet. At the bottom of the mountain the average vertical distance between terraces is about 70 feet. During 1918, notwithstanding the war conditions and difficulties of industrial operations, more than 4,270,000 yards of rock and nearly 6,000,000 yards of ore were excavated and the operations had been systematized and are progressing with increasing rapidity.

Blasting in Terraces

Operations were commenced by blasting off about 150 feet of the sharp top of the mountain. Holes were drilled with churn and air drills, charged with about 11 tons of powder and simultaneously fired, making a fairly uniform surface on which grading and track laying were immediately commenced. The top of the mountain was reached by about 2¾ miles of railroad track, most of it at a grade of 2½ per cent with sharp curves and two switch-backs.

Three hundred feet of the upper part of the hill is being removed in four terraces with 3 sections 60 feet high and one with a maximum height of 120 feet. The excavation of the upper bench was commenced first and was kept well in advance of the lower benches in order to avoid possibility of undermining.

In the lower benches the 3½-inch holes about 30 feet deep are drilled and are protected by a box at the top of the hole. The holes have a tendency to ravel and some that have been drilled by cyclone drills were cased with iron pipes to prevent them from filling up.

Loading and Firing

The holes are loaded with red H. No. 4 dynamite marked 60 per cent. In June, 1919, 369,000 pounds of explosives were used to shatter 1,035,000 yards of rock.

The holes are sprung with a preliminary charge of explosive and, before it is fired the workmen are warned by a long whistle and three short ones and take refuge in huts made of old railroad ties. A completion of the blast is signaled by two long whistles after which the men return to their work. Large fragments of rock are block holed when necessary and the loose material is barred off and forms slopes of about 75 degrees that are removed by the 21 steam shovels.

Handling Rock and Ore With Steam Shovel

The shovels are installed on tracks about 25 feet from the service tracks on which five-car trains receive the ore that is hauled by locomotives. All of the shovels are covered by a housing of ⅜-inch planks, sheathed with steel to protect the crew of engineer, fireman, crane man and coal man from flying stones. Each shovel also requires a crew of five to lay the five

Twenty-one steam shovels, working in eighteen lifts, removing a mountain 1,600 feet high, containing 10,000,000 yards of hard rock and ore

foot lengths of track ahead of the shovels, operate the jack screws and keep the loading track clear of broken ore.

Owing to the fact that coal can be secured within a distance of 130 miles from the mine, the shovels are still operated by steam, although it is anticipated that electric shovels will eventually supersede steam shovels.

Each shovel makes a cut from 20 to 25 feet wide and each terrace is equipped with one line of compressed air and another line of water pipes.

The steam shovels deliver into 30-yard 5-ton automatic dump cars, 12-yard dump cars and one the top level into 4-yard and 6-yard crab cars.

Storage

Parts of the material are sent directly to the mills and the remainder containing a smaller percentage of copper is stored until it can be treated at the leaching plant. Considerable difficulty has been encountered in providing storage places and a number of service tracks are run up different to provide spoil banks in three of which, 20,000,000 tons have already been deposited. Ore is taken to the mill, which has a capacity of 4,000 tons per day, in 20-yard side dump cars that discharge their contents to a grizzly over a 56 x 84-inch rock crusher. When operations were in full swing last year, from 20 to 25 trains per hour were delivered from the four upper benches.

The work is under the direction of A. G. Goodrich, chief engineer, and Arthur Notman, general superintendent.

News of the Cement Mills

There is reason to believe that the cement plant at Ragland, Ala., owned by the Coosa Portland Cement Co., W. S. Lovell, receiver, Birmingham, Ala., may be put into operation in the near future in an effort to overcome the cement shortage, which at this time is particularly acute in this section, says the Gadsden, Ala. Times.

Many indications, the most prominent being the known fact that the company is estimating the cost of putting the plant into condition to operate, point to a renewed activity in the nearby plant.

Recent acquisitions of the Standard Portland cement plant at Leeds, near Birmingham and the re-habilitation of operations at the Demopolis plant, now owned by the Gulf States Cement Co. indicates the trend of the trade in this state is toward a re-habilitation of all idle plants.

There are at present in the state four cement plants with a capacity of more than two million barrels a year and cement is bringing $2 a barrel.

The Alabama plants and their locality are as follows:

Standard Portland Cement Co. now the Atlas Cement company, at Leeds, 1,000,000 barrels per annum.

Gulf Cement works, Ragland, not now in operation, 750,000 barrels.

Southern Cement company, Birmingham, 150,000 barrels.

The last named corporation a producer of cement manufactured from furnace slag, and this product is used especially in foundation work of large structures.

Geo. E. Nicholson of Kansas City, Mo., formerly president of the Iola and Dixie Portland Cement companies has purchased the properties of the Coosa Cement Company of Ragland, Ala. At present this plant which has a daily capacity of 2,200 barrels is closed down.

Eddyville, Iowa, and the country near the Red Mineral Springs may be the location of a $1,500,000 cement manufacturing plant if the efforts of F. L. Jaeger, representative of the Marquette Cement Manufacturing company of Chicago, are successful.

Mr. Jaeger, the latter part of July, filed with the county recorder options on 811 acres of land lying along the Des Moines river, southeast of Eddyville.

Mr. Jaeger left for Chicago, where he will present before the officials of the company his report on the optional land and it is probable that upon his return to the city will bring with him a drilling crew and further investigation of the land will take place.

For the past several weeks Mr. Jaeger has been prospecting the land near Eddyville, seeking a location for a cement plant and in the hills and valleys near the mineral springs he has found the materials of which cement is composed, in such quantities and of such quality as to lead him to believe that the land upon which he has options is admirably suited for the establishment of a cement manufacturing plant.

The Acme Cement Co., Catskill, N. Y., after a shutdown of about three years, has resumed the manufacture of cement, turning out the same high quality product for which the plant has always been well known. Using the wet process which eliminates all dust a higher quality product is turned out than is possible under other systems. The plant of the Acme company has a capacity of 3,000 barrels a day and shipments can be made by rail or water, as there is a railroad siding direct to the works and a long dock from the works to the channel of the river. Workmen under the direction of A. F. Carleson, the superintendent, have been busy getting the plant in shape since February and the works, which are of the most modern construction are in readiness to turn out the plant's full capacity.

A 50,000 gallon steel water tank is in course of completion at the plant of the Sandusky Cement Co., Dixon, Ill. The big new pressure tank is built on a high piece of ground and will supply water for the houses that are in course of construction for the employes of the plant. The tank is being built by the Chicago Bridge & Iron Company.

At an expense of more than $150,000, the plant of the Sandusky Portland Cement Company located on the shores of Lake Wawasee at Syracuse, Indiana, is being altered so that it will be possible to manufacture cement from limestone instead of marl. Great quantities of limestone are to be shipped to the factory from Logansport, Ind.

Until the Indiana general assembly enacted legislation which made it unlawful for the Sandusky company to operate a dredge on Lake Wawasee, marl was taken from the lake and used in the making of cement. Wawasee cottagers, objecting to the smoke from the company's dredges, started agitating against the industry and after a hard fight the company was defeated. Since then the plant has been idle. Several hundreds persons who were employed there have gone elsewhere.

With arrangement completed to get a supply of limestone from Logansport, it is expected the plant will soon resume operation at full force.

The Owens-Ames-Kimball Co., contractors, of Grand Rapids has begun work on a new stone storage building at the plant of the Newago Portland Cement Co., Newago, Mich. The Newago company is rushed with orders but is seriously handicapped at times by the coal shortage and inability to obtain sufficient box cars. As many as 25 trucks are making daily trips between the plant and Muskegon loaded with cement.

Very good progress is being made on the colony of new dwellings under construction for the Sandusky Cement Co. at Dixon, Ill. Nine of the big houses are now well under way, five of which are nearing completion. The buildings are two stories high with a spacious basement.

Scarcity of labor is responsible for the fact that the buildings are not completed and occupied by employes of the cement plant at this time. Considerable difficulty has been experienced in securing carpenters and cement block layers in sufficient numbers to hurry the work along. It is expected that five of the buildings will be ready for occupancy this fall. The sewer system and water mains have been laid and laterals connect each of the houses.

A big garage has been built along the river bank, just opposite from the cement plant offices to accommodate automobiles belonging employes.

"Did you ever stop to consider," writes the Lansing Electric Engineering Company, Lansing, Mich., "that we have spent years of our time on your electrical problems? Years of untiring efforts which embraced university training, laboratory tests on material, plant analysis, etc? We offer you today the services of men from our organization who can carry your problems through to a successful issue, can meet your emergency just the same as we met others."

"We are specialists in Motor Designing, Motor Building, Coil Building and Power Surveys. The knowledge we have gleaned after making a thorough study of cement mill plants and their operation, the experience we have gained through making the cement industry our choice of operations and our factory facilities, we offer you now. We know we can be of aid to you and we also know you have your electrical problems to solve."

"An engineering specialist will answer every inquiry of yours and answer it in an understandable way. Our service extends all over the United States."

The Link Belt Company recently installed silent chain drives in connection with the individual motor drives on the tube mills, clinker grinding mills and on other machines at the plant of the Superior Portland Cement Company at Concrete, Washington. A Link Belt Silent Chain drive delivers 98.2% of the power to the Ball Mill. It keeps the balls in the mill at a continuous whirl without the slightest variation. It therefore insures maximum output and maximum efficiency from each mill. There is no slippage as with belts. There is no necessity for long centers, wasting space. There are no shut downs due to breaking belts. For, with chain drives, the power from the driving motor is chained to the driven machine. Every revolution of the motor shaft means a like revolution of the machine shaft.

To establish a $2,000,000 cement plant in Scott county, Iowa, the Western States Portland Cement Co., of Independence, Kan., recently paid $194,000 for a site in the vicinity of Bettendorf.

The decision of the company to build a plant in Iowa follows many weeks of careful testing of the earth on the farms purchased. Drilling was done in many places on each farm and then the soil was carefully tested by experts of the company. This phase of the work was in charge of Dr. H. J. Robertson, an expert chemist.

A short time ago the drilling ceased and there has been much speculation as to the outcome of the tests. That they were successful is proved by the decision of the company announced last month.

With the property taken over by the cement company the officials are now negotiating for proper trackage and shipping facilities for their business. A group of railroad officials went with Mr. A. D. Standcliff, general superintendent, to the site of the factory to arrange for this feature of the project.

It is expected that work will begin by fall on the new project. Decision as to housing facilities for employes, which will number several hundred, will be made later.

In addition to the cement plant it is planned to have a rock crushing department.

The Peoples Light Co. has a deal on with the cement company for the erection of a cable spanning the Mississippi river from its Moline power plant to Bettendorf to transmit power for the cement works.

In an interview Mr. Stancliff stated that the construction plans of the company were rather indefinite as some legal matters would have to be adjusted first. Just how long this would take he did not know. He was hopeful, however, that the plant would be in full operation next year.

As to the number of employees he estimated the plant would have at least 350 employees on the payroll. Special attention will be given to the making of cement while a crushed rock department may also be operated.

Mr. Stancliff was not prepared to announce the probable expenditure of the company on its second big plant, the other one being operated now at Independence. He stated the minimum cost would be at least $1,000,000 and would vary greatly due to the cost of the steel and other building equipment.

The fact that the tri-cities is a great market for cement led to the decision of the Independence concern to establish a cement factory in this vicinity, he stated.

The Burt Portland Cement Co., Bellevue, Mich., recently installed a steam ash conveyor which is expected to cut in two ash disposal costs.

The Alsen Cement Co., Alsen, N. Y., plans to enlarge its operations in every department next winter, and for this purpose the company will spend $200,000 to improve the plant so that its capacity may be brought up to 4,000 bbls. a day. In view of the enlarged capacity to follow the improvements, an order has been placed for a new crane to cost $35,000.

A large plant to divert heat that is now wasted at the Edison Portland Cement plant is the big feature of the improvements that are being made. The Babcock & Wilcox Company of New York City has the contract for the work, and it is contemplated that the contract will be completed in July.

It is estimated that the company will be able to save $250,000 annually on its coal bill when the work is completed. At the present time there are 10 kilns at the Edison plant that burn the cement. Much of the heat which now passes off into air and is wasted will be used to generate steam in the high pressure boilers included in the waste heat plant.

H. Webster has left the Willston Iron Furnace Co., Superior, Ohio, to accept the position of superintendent of the Crescent Portland Cement Co., Wampum, Pa.

The Knickerbocker Portland Cement Co. has a waste heat boiler installation in its mill at Hudson, N. Y., which was done by the Edge Moor Iron Co., of Edge Moor, Del., which is proving very satisfactory.

The Texas Portland Cement company's new unit that is being constructed at Houston, Tex., on the ship channel is nearing completion. New machinery has been installed and company officials expect that the new unit will be in operation by Aug. 25th.

The unit is due to be in operation now, but owing to lack of material and railroad strikes its construction has been delayed. Work on the new unit began last September and was due to be in operation by November, 1919, the month originally set, officials said.

A capacity double that of the original plant is expected when the new unit begins to function smoothly. It is believed the plant will then turn out from 65,000 to 70,000 barrels of cement a month. The present plant averages from 28,000 to 35,000 barrels.

Eight barges of cement from Atlas cement plant at Hannibal, Mo., consisting of 6,000 barrels recently

arrived in Alton, Ill., and the sacks were transferred to cars for shipment to the contractors doing state road work hereabouts. It was said that the arrangement of shipping by barge to Alton is so satisfactory all the cement for roads in this vicinity will be so barged here and transferred to the railroads for distribution.

The Newago Portland Cement Co., L. E. Smith superintendent, Newago, Mich., last year produced 406,000 bbls. of cement and 483,000 bbls. were sold, the company's warehouses being practically empty at the close of the season. A large increase in output is planned for this year, new storage capacity being added to enable the plant to continue operations several months later than usual.

R. J. Messier, 1840 Sherman St., Denver, Colo., writes: "I control several hundred acres (7 miles below Colorado Portland Cement Co. plant and 3 miles below the U. S. Cement Company's plant) containing the very best limestone and shale for manufacturing cement. Plenty of water, coal mine nine miles inland. Would like to interest parties to biuld a cement plant thereon."

W. J. Swegman, graduate engineer has been added to the staff of J. C. Buckbee Co., engineers, First National Bank Building, Chicago. Mr. Swegman has had a large amount of experience in designing, building and operating cement plants, also experience in crushing and grinding of various other materials, power plant construction and general engineering. He graduated from Purdue University in 1906, starting with the St. Louis Portland Cement Co., following which he was engaged by the Superior Portland Cement Co., Texas Portland Cement Co., Free Born Engineering Co., Ebro Irrigation & Power Co. of Barcelona, Spain, Hunt Engineering Co., as superintendent and mechanical engineer for the Wabash Portland Cement Co., and mechanical engineer for the Lambert Chemical & Acid Co. Mr. Swegman returned to the Wabash Portland Cement Co. as mechanical engineer for additional improvements 1 year ago, and having recently finished this work has joined the Buckbee organization.

A Portland cement plant of large capacity, one of Fort Worth's most vital needs, will probably be established here in the near future, according to Roscoe Ady, publicity commissioner of the Chamber of Commerce of Fort Worth, Texas. The requisite supply of limestone rock and shale in juxtaposition is available at several points within a reasonable distance of Fort Worth under ideal conditions for cement making.

Fort Worth is the supply center for that portion of Texas in which the greatest amount of road building and general construction is now going on, but the nearest cement plants are at Dallas, Houston, San Antonio and El Paso each have one. Fort Worth is the only large city in the state that lacks one of these essential aids to builders.

Mr. Ady has collected data showing the approximate amount of new building under way in the cities of North Central and West Texas—Fort Worth's legitimate trade territory—which is alone large enough to keep a cement plant running to capacity for many months. A total of $85,000,000 in good roads bonds has been voted throughout the state and $25,000,000 more worth of bands have been proposed and are about to be voted on. Of recent years a strong tendency has developed toward the building of concrete roads, in the construction of which cement is essential. The first cost of concrete road is heavy, but the expense of maintenance is practically nothing, Mr. Ady said.

Mr. Ady has written several large cement companies outlining the opportunity presented to a cement plant here, and has received favorable replies from three of the largest concerns in the United States. He believes that it will be only a short time before at least one of them begins construction of a plant in Fort Worth.

The Edison Portland Cement Co., New York, N. Y., has just issued the folowing announcement: From now on the will adopt the practice of quoting a uniform delivered price on Edison cement, applicable to dealers and consumers alike. Recognized dealers will be allowed 10 per cent trade discount from the delivered price, exclusive of the value of the package. This action has been deemed advisable in fairness to dealers, who are today receiving no more remuneration for their services than formerly when prices and costs of doing business were approximately half of what they are today—and to give contractors more stable prices by the elimination of the present uncertainty prevailing on the border line between territories having various differentials. The above is no way affects the present cash discount of 5c per barrel for payment of invoices within ten (10) days from date of shipment.

William C. Reith has resigned as engineer and superintendent of the Oklahoma Portland Cement Co. to accept the position of chief engineer of the Southwestern Portland Cement Co., with offices at 607 H. W. Hellman Bldg., Los Angeles, Cal.

The Superior Portland Cement Co., Concrete, Wash., is installing an additional Raymond mill in its coal plant. This will make three Raymond mills in operation on coal. A 7′ x 75′ coal drier, to be fired by powdered coal, is also being installed. Lengthening of one 8′ x 135′ kiln to 8′ x 192′ is being completed, which will give the plant a total capacity of 3,300 bbls. per day.

A new quarry is being opened up and one Marion 60 shovel, one Thew shovel, an Armstrong blast hole drill and a Farrel jaw crusher are being used. At present the quarry has a face 500′ long and 60′ high, and will soon have face 1000′ long and 100′ high.

The Colorado Portland Cement Co., Portland, Colorado, is opening a new shale quarry and a new lime quarry on the bank of the Arkansas river, and has purchased an additional drilling outfit, (an Armstrong) to push the drilling operations. A new Jeffry mill has been purchased for the raw end to give an additional capacity there, so that the kilns may be crowded. A new Permutit water clarifying and softening device has been installed and is now in full operation, giving a supply of zero water. All the housers in the village are being plastered again on the outside and repainted, brightening things up considerably.

"I am aware that some of the equipment at the Hawkeye cement plant is not satisfactory, but in most cases where there has been a protest from the men, steps to remedy the situation have been taken," statd C. B. Condon, general manager of the plant, in the hearing before the arbitrators. He was on the stand most of the afternoon. "We will not recognize the men as a union, or let them dictate to us," he said, when Attorney C. C. Putnam asked him what was

the company's attitude toward the so-called strike.

It was brought out that the company's net earnings after all taxes had been paid, was 11 per cent on a invested capital of $1,600,000.

C. Dowling of the Integrity Mutual Casualty company, who recently wrote insurance for the Hawkeye plant, admitted on the stand that although he had recently inspected the plant at the company's request, he knew little of the conditions there, or the safety devices in use on the machinery. (Des Moines Register).

Efficiency of Rotary Cement Kilns

Alex D. Leipper, A. I. C., contributes the following article based on experience gained with the British Portland Cement Research Association during the last few years.

The article in the June issue by Mr. W. E. Snyder serves a useful purpose in keeping alive the interest in this subject and he brings out some points, attention to which, will, by the exercise of a little care, and at very slight expense, markedly improve the performance of a kiln.

However in stating that there has been a lavish waste of coal in rotary kilns in the past due largely to coarse grinding, he condemns coarse grinding on an issue which will fail to command universal acceptance. Coarse grinding has grave faults, but thermal inefficiency is one of the least of them, and properly understood and applied it has advantages in solving certain difficulties in burning, not the best solution it is true, but one which can be readily applied, and is on that account suitable as a temporary expedient.

In estimating the real value of the ground coal by eliminating the residue which fails to pass the 100 mesh sieve we are not to infer that such coal fails to escape combustion, but that there is an overall decrease in the thermal efficiency of the kiln due to the coarse grinding of the coal and that the residue on the 100 mesh sieve serves as a measure of that decrement.

It is conceivable that with some kilns this index may be applied with some approach to accuracy as a guide, but it cannot be formulated as a rule applicable in all cases.

Let us consider what takes place in burning with coarse ground coal. Coarse ground coal frequently contains nibs which are not carried into the burning zone of the kiln but fall on the brickwork or clinker close to the discharge end of the kiln and burn there where there is a plentiful supply of air making for complete combustion. They thus fail to radiate heat at the clinkering zone, but their products of combustion travel almost the full length of the kiln, and thus the relative extraction of heat from the gases will be at least fully as great as that from the gases of the fine ground coal. On this account the thermal efficiency of the nibs is likely to be slightly greater than the coal as a whole. Coal coarsely ground is slower in igniting and longer in burning than fine ground coal of the same quality, and thus the combustion zone will be carried farther up the kiln so that the distance, in which the gases suffer a fall of temperature, is decreased and the gases leave the exit end at a higher temperature, and the thermal loss from that source is higher. At the discharge end of the kiln, however, the clinker travels a greater distance from the clinkering zone to the nose ring giving up more of its heat to the air supply and leaving the kiln cooler. Thus from this source there is an increase in the thermal efficiency of the kiln and in the writer's experience, which has been with relatively long kilns, the decrease in thermal efficiency at the exit end, and the increase at the discharge end almost balance, and he is afraid that on account of thermal inefficiency alone it would be difficult to induce those responsible for the kiln's working to adopt fine grinding of coal.

Even when the kiln is provided with a cooler and the terminal temperature of the clinker is scarcely affected by the position of the burning zone in the kiln the alteration of the combined thermal efficiency of kiln and cooler is slight. The reason of this is that the cooling of the clinker which takes place in the kiln is much more thermally efficient than that which takes place in the cooler.

Alex. D. Leipper, A. I. C.

Boom-and-Bucket Delivery on Paving Mixers as Against the Chute System

In some districts paving contracts call for a paving mixer equipped with the particular type of discharge favored in the eyes of the engineers in charge This has in many cases brought some hardship to bear on the contractors because of the fact that he could not use the equipment on hand and from which he had probably not gotten the full value that his investment should call for. Not infrequently it has been necessary for him to either sell (generally for little more than "a song") or allow his paver to stand idle and purchase a new machine which fulfilled the demands of the specifications.

It is not the intentions of the engineers in charge to be arbitrary or design rules which will work hardships and limit the profits of the contractors. Far from that. It is their zealous desire to insure good, lasting roads for their constituents which prompts these demands. True, some of the requirements inserted in many specifications with reference to the delivery of the concrete are entirely irrelevent and have no bearing on the ultimate results obtained. Yet their presence can hardly be laid to ill motives but rather to misapplied knowledge of the conditions that enter into the problem.

For example: Recently, some specifications have been issued demanding the boom-and-bucket delivery as against the chute system. By so doing they have put themselves on record as actually being against the chute delivery as an efficient method of delivering concrete, when, as a matter of fact, the objection should not be to the entire chute system, but rather to the type of chute used. From a standpoint of economy and efficiency, it is not possible to conceive of any better method of placing concrete than by the chute method. The question that might easily arise, therefore, with reference to the chute delivery should be limited solely and entirely to the *kind* of chute employed.

It has been definitely determined by the National Conference on Concrete Road Building through the committee on Mixing and Placing of Concrete, after exhaustive tests, that a road equal in durability to any other can be obtained by placing concrete through a

swivel spout *if the chute used is tilted at an angle of not lower than 20°*. It might not be out of place at this moment to suggest that the engineers in writing up specifications call for a boom-and-bucket paver or a chute paver having a tilt of at least 20°.

In fortifying himself against any possibility of not being able to make the fullest possible use of his paving equipment, it is suggested that the contractor observe the following simple rule in purchasing this paving mixer: Make it a point to find out from the manufacturer, or his agent, in definite, unmistakable terms whether the boom-and-bucket paver which he purchases can be converted to chute delivery or vice versa, should the necessity for that equipment arise. By so doing, he will be protecting himself against any action which "the powers that be" might take on this question. Such convertible pavers are procurable from some of the leading manufacturers.

News of the Concrete Products Factories

Licenses to manufacture cement blocks were given to Leon F. Owen, located at the intersection of Clinton street and the Grand Trunk railroad, and to the Pontiac Tile and Brick company, located at the corner of Orchard Lave avenue and the Michigan Air Line tracks. Both of Pontiac, Mich.

Using a time of adversity for preparation for future growth is what one concrete product manufacturer—the Appleton Sewer Pipe Works, B. B. Gochnauer, secretary, is doing. The car shortage has brought its plant to an abrupt standstill. Rather than let its skilled help go elsewhere, and in order to keep working, a new addition is under construction.

The company ordinarily uses about 12 or 15 barrels of cement a day. All it has been able to get is small lots of 25 barrels every ten days. Only three cars of sand have been received so far this year. The organization limped along until conditions became so bad that manufacture of cement blocks ceased.

Taking advantage of the dull times, the company has devoted its attention to building of a one-story concrete block addition, 30 by 60 feet, to the west end of its plant on Meade street. The outer walls are almost finished and the building will be enclosed in a few days. It is to have a concrete floor, and will cost about $3,000.

The new unit will house a steam kiln for curing the cement blocks. Two block machines will be added and the remaining space will be used to make sills, ornamental pieces and other products requiring extra floor space. The normal output of the plant has been from 450 to 550 blocks a day. The added machinery will increase the output at least 300 blocks a day. Two complete crews of men will be added as soon as conditions stabilize themselves

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The Home Builders Cement Products Co., River Rouge, Mich., has increased its capital stock from $20,000 to $50,000.

The Dakota Concrete Stone Company, Sioux Falls, S. D., has been incorporated for $100,000 by S. H. Edmunds, J. B. Wildberger and A. L. Edmunds. They operate McCracken drain tile machine and Blystone mixer. Want prices and catalogs on sewer pipe and culvert molds.

The Manitoba Self-Locking Concrete Wall Co., operating the Sawyer system of hollow concrete wall construction, has been formed to operate in the province of Manitoba and the territory eastward towards Fort William. They are installing their plant at Winnipeg. The company includes John W. Sifton, Douglas Laird. Edward Kelly, and Mr. Haven. The company looks forward to building many grain elevators in Western Canada by the Sawyer system. They expect to have three or four plants turning out blocks this year and to have at least a 15,000 ft. per day production before the season is over. Chris Simpson, one of the company, and Mr. Ross are supervising the building of the Winnipeg plant. Orders for over 100,000 ft. are already on hand.

The Lewiston Concrete Culvert Co., Lewiston, Mont., has filed articles of incorporation, being organized to manufacture culverts and other concrete products on a large scale. It is capitalized for $40,000, and now has a large plant in operation, this having been formerly conducted as a private enterprise. The directors are J. E. Miller, J. R. Miller and O. O. Mueller.

The Sanatar Company of Indiana was recently incorporated at Indianapolis, Indiana, with a capital stock of $50,000.00 for the purpose of manufacturing Sanatar Sewage Disposal Tanks. The Sanatar Sewage Disposal Tank is designed for use where sewers are not available. A novel feature of the Sanatar consists in the portability of the tank, as it can be built up so as to accommodate the smallest unit required necessary to take care of the sewage disposal of five people to the largest installation for a hotel, school house, etc. The Sanatar Tank is built upon lines approved by the United States Health Service and has received the special commendation and approval from the State Board of Health of Indiana and other States. It is built of reinforced concrete and is light in construction. The company is operating a plant at Portland, Indiana, and will have another one in operation at West Pal Beach, Florida, in the near future. The product will be sold through jobbers only.

The Concrete Products Corporation, West Liberty, Iowa, has been incorporated for $500,000. The incorporators are John H. Irey, president; Glenn Fairall, vice-president, and R. O. Deevey, secretary. The company will manufacture the Irey cement stave for corn cribs, silos, coal pockets, bins, etc.

The Anamosa Cement Products Co., Anamosa, Iowa, new plant is completed and they are in a position to handle a rapidly growing business. They have also opened a branch plant at Cascade, Iowa, in charge of D. W. Russell. They will manufacture staves for silos and cement blocks.

The Judson Concrete Co., Judson, Minn., are having big success with their cement tile (made by Sioux City machine) and concrete block (W. F. Hunt machine) which are 6″ high, 24″ long, 8″-10″ wide and sell for 22 to 26c. The tile sell for about $10.00 per ton. Blystone mixer used.

The Washington Concrete Products Co., Washington Court House, Ohio, are making extensive improvements which will double their present capacity. They operate Hayden and Ideal block machines, Little Jiant hand brick machine and Jaeger mixer. The plain blocks bring 21 cents and rock face 23 cents. They are in the market for a continuous concrete mixer, fence posts and porch columns molds.

A group of 25 cement stave silos has been erected on J. J. Welder's farm, Victoria, Tex. Less than 50 per cent of the land in Victoria county is under cultivation, according to the general manager of the Victoria Chamber of Commerce.

The General Concrete Construction Co. have removed their offices from Charlotte to Monroe, N. C., in order to keep in closer touch with their factory, which is situated at the latter point. This company makes disposal plants, septic tanks, curbing and concrete sidewalks, besides anything else in concrete.

Mr. C. F. Breeden has a modern cement products factory at Newburg, Iowa. He has recently erected a number of cement stave granaries for the farmers in his vicinity. These combination corn cribs and granaries provide safe and economical storage of grain on the farm until market conditions are right. Mr. Breeden operates a Waterloo Perfection Tamper block and brick machine, New Monarch Machine & Stamping Co.'s cement stave silo molds and Iowa Foundry & Manufacturing Co. concrete mixer. He intended to install new machinery in the near future and wants prices, samples and catalogs on burial vault, vases, porch columns, building blocks and silos, molds, waterproofing, facing materials for concrete blocks.

Peoria Concrete Construction Co., 305 Broadway, Peoria, Ill., operate Hobbs and Ideal concrete block machines and Wonder mixer. Blocks 8x8x16, sell for 18 and 20 cents. Use sand and Crown Point spar for facings. Are interested in waterproofing compound and crushers.

E. H. Nortoni, New Cambria, Mo., reports splendid business and bright prospects for his cement sewer pipe and concrete blocks. The blocks are 8x8x16, faced with ground white crushed stone and sell for 24 cents. He operates Dunn molds and American Cement Machine Co.'s mixer.

H. G. Roethel & Co., Rome, Wis., have complete extensive improvements in their concrete products plant. They operate a Miles block machine and will install another block machine shortly.

Rinklenberg Bros., Edgerton, Minn., wants to buy 10 to 12 block carts of 4″ track base and 30″ top.

The Santa Clara Valley Concrete Pipe Company, Santa Clara, California, has been organized, and two of the principal stockholders in the concern are Herbert C. Baker and Frank W. English. It is the intention of the company to manufacture concrete pipe of various sizes.

The pipe will probably be manufactured in Santa Clara as Baker and English are on the lookout for a a location here. During the past few years there has been a big demand for concrete pipe in various parts of the county.

The Vermont Cement Brick Co., Bellows Falls, Vt., recently organized, operate a Helm brick and block press and a Kent mixer. Their blocks are solid, 4x8x24, and sell for 30c each, having mica spar crystals facing. Bricks sell for $32 per thousand. Want prices and catalogs on machines and molds for making fence posts, roofing tile, burial vaults, porch columns, sewer pipes, silos and culverts. Interested in waterproofing compounds.

Fellabaum Bros., Toledo, Ohio, handle their blocks from Besser single block machine to curing room and from curing room to storage, with Jacklift trucks made by Lewis-Shepard Co., Boston. "The Jacklift saves re-handling," writes Mr. Fellabaum, "it can turn around on a dime almost and the trucks represent more flexible equipment than a car and track system." They operate Besser block and brick machines, Besser and Jaeger mixers and a Walter roofing tile machine. Their blocks are faced with fine sand and cement and sell, plain, for 30 cents.

The concrete Stave Silo Co., Watertown, S. D., and Minneapolis, Minn., are having big success with the Brooks patent stave silo, which is equipped with the best and most convenient door hanger.

The Waterbury Concrete Block Co., Waterbury, Conn., has been incorporated for $25,000 by G. F. Mulligan, M. B. Moore and Michael Jacobson all of Waterbury.

The Frankfort Cement Burial Vault Co., Frankfort, Ind., is constructing a new plant at that place. When completed the plant will be one of the largest and best equipped in that end of the state.

The Mooney Art Stone Co., Akron, Ohio has increased its capitalization from $10,000 to $25,000.

The Wert Manufacturing Company, Kendallville, Ind., was recently incorporated with a capital stock of $525,000. The company will make use of the patents of C. S. Wert who was made vice president. The "Perfect" concrete block and brick machines, both hand and power tamp, made by this company is one of the oldest on the market.

Ephriam Johnson, Eveleth, Minn., who operates a sand and gravel pit south of the city has decided to manufacture concrete products such as roofing tile, brick, drain tile, culverts and porches. He now operates a Dunn block machine and gets 30 cents a square foot for his blocks. Mr. Johnson intends to use "Stonekote" manufactured by Garden City Sand Co., Chicago for facing his blocks.

The Benfer Concrete Machine Co., Cleveland, Ohio, recently incorporated capital stock $500,000. They are manufacturing the McIntyre building tile. When in the wall they provide perfect insulation from temperature changes owing to two blankets of live air that enter the wall thru ventilators near the base and travel continually upward escaping thru openings made in the roof plate.

Long Handled Trowel Makes Floating Easy

Today when labor costs are so high that it behooves every contractor to consider labor saving devices, the long handled trowel illustrated will be a welcome innovation. This tool is used principally for floors and sidewalks where a very "slick" smooth finish is desired. By its use the workmen can reach across the widest sidewalk or cover a wide expanse of floor. No bridges or planks are needed for the final troweling and it goes without saying that the device is popular with the cement finisher, because it saves stooping over and wear on workmen's overalls!

These trowels come in various widths, the one shown being about 20 inches wide. By an ingenious method of pivoting the handle, the trowel is rocked slightly on each stroke so that the forward edge is slightly raised from the concrete, thus giving the trowelling motion identical to that secured with the usual hand trowel. This is clearly shown in the photograph. In other words, the forward edge of the trowel is lifted on the out stroke and the back edge lifted on the return stroke, thus preventing the edge of the trowel digging into the concrete.

Of course, with this tool, the same as with the ordinary hand steel trowel, there must not be too much troweling and working of the surface as this tends to bring up the fine particles to the surface and may cause some dusting or hair cracking.

They Beat Competition All Hollow

They are doing it right along, for every contractor who uses them. They meet high material prices by cutting labor costs, and represent the maximum in Economy and Efficiency.

JAEGER MIX-A-MINUTE MIXERS

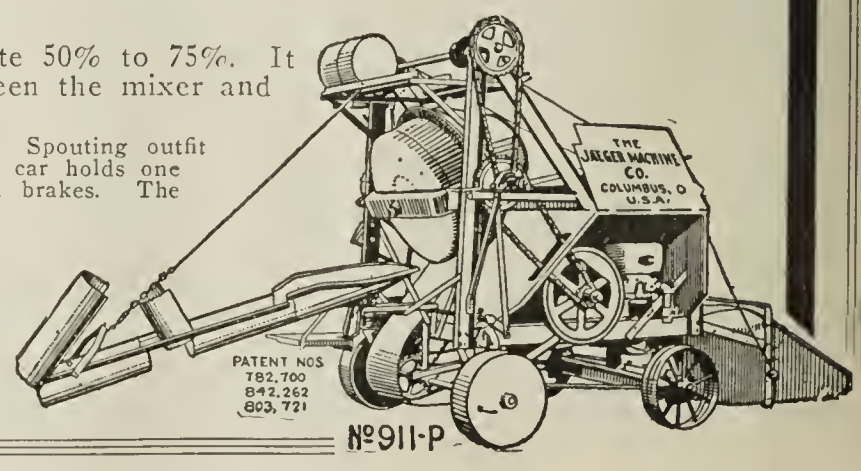
Are Built in Sizes to Meet Every Man's Need

By years of careful study of the contractor's problems—by making his problems our own—we have evolved a line of mixers which combines all the superior points of the best machines, and one that will serve him best under all the varying conditions of work.

FOR BUILDING CONSTRUCTION

Jaeger Placing Equipment cuts the cost of placing concrete 50% to 75%. It works right at the material piles, and needs no man between the mixer and the forms. **It serves the entire structure without moving.**

The plant consists of the Jaeger Mixer complete with loader and hoist. Spouting outfit consists of 50 feet of track in 10 foot sections and adjustable legs. Skip car holds one full batch of concrete and is automatic in dumping and equipped with brakes. The hoist pulls this car up to hopper where it dumps.



Write for Illustrated Catalog

THE JAEGER MACHINE COMPANY

212 DUBLIN ST., COLUMBUS, OHIO

Cement and Engineering News

Vol. 32 Chicago, September, 1920 No. 9

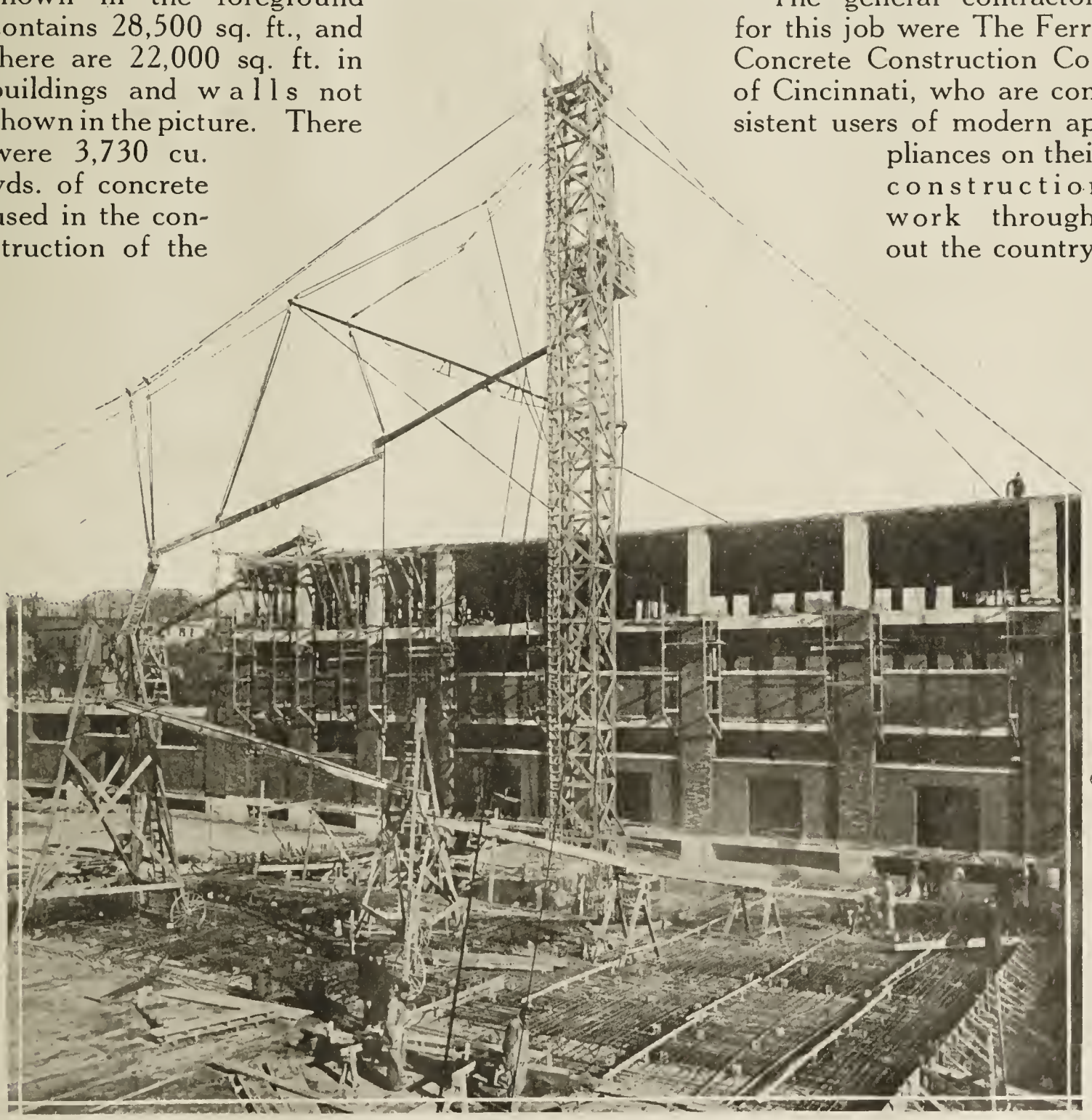
New Standard Oil Warehouse in Cincinnati

There has just been completed in Cincinnati a large concrete warehouse for the Standard Oil Co., who will use it for storage of supplies.

The ground area of this warehouse, as shown in the accompanying illustration, is 20,650 sq. ft. The yard slab shown in the foreground contains 28,500 sq. ft., and there are 22,000 sq. ft. in buildings and walls not shown in the picture. There were 3,730 cu. yds. of concrete used in the construction of the warehouse, and the whole job required 7,100 cu. yds. of concrete. Bricks were used for spandrel walls and column veneer.

The concrete was distributed by means of one central mixing plant and a tower 180 ft. in height.

The general contractors for this job were The Ferro Concrete Construction Co., of Cincinnati, who are consistent users of modern appliances on their construction work throughout the country.



Editorial

Make Your Business Better

The building of cement stave or circular monolithic concrete structures for grain storage, water tanks, coal pockets, silos and corn cribs is going to be the truly best construction business for the next few years. The field of work is new and open, and the profits are high. The wise contractor will get ready for a big business this fall and next spring by equipping himself with molds and forms. The business is bound to be good for the man who is ready. Equipment and machines can still be bought at a very low price, notwithstanding the present prices of steel.

Foreign Trade

The present prospects of business depression emphasize the importance of utilizing foreign markets to provide continuous and steady outlets for the products of farms and factories.

To show graphically the very real interest of all parts of the country and all elements of our population in our foreign trade, the National Foreign Trade Council, Hanover Square, New York, N. Y. have recently issued an illustrated pamphlet describing the "Sources of our Exports". The text accompanying the charts has been written by men who are recognized as leaders in their respective lines.

It is not generally known that foreign trade now forms about 17% of our total commerce; or that our productive capacity in many lines now exceeds domestic requirements. Naturally, very few among the farmers and factory workers of the country realize that the products of their hands are sent abroad, and that their continued prosperity and employment, in many cases, depends on the maintenance or development of foreign trade.

Without such a broad understanding of our foreign trade, the best efforts of our exporters and importers are constantly blocked by ill-considered legislation, partisan and political policies, or blank incomprehension. Yet in the coming competition with the traders of foreign nations, our exporters must have the undivided support of all elements of our population, of our Government, and of the Press.

Business Conditions and the Building Situation

Hesitation in business is general. People are on the fence, undecided whether to go forward or not. Forward motion is progress, backward motion is death. On the one hand we have those who are trying to beat down prices, and on the other those who are trying to secure increased production, from house-building to transportation. They are pulling against each other, though both are striving to reduce the cost of living. The law of supply and demand is working today as of always, and until supply is greater than demand we will have people bidding against each other, with the inevitable result of raising the price level.

Greater energy and more work are the only things that will increase supply, but to accomplish this there must be an incentive which will create the desire to work harder. If a man who wants to increase production sees that there is only a bare chance to make a little profit on his work, with the likelihood of losing on the job, he is very apt to seek other fields offering better prospects for his investment.

Take the building industry. The urgency of the need for new building throughout the country is unmistakable. Competent authorities have estimated that the country is behind in its building program from eighteen months to two years, which means, it is said, a shortage of anywhere from $3,500,000,000 to $7,000,000,000 worth of construction.

Slackness in building is attributed in large part to hesitation to undertake new building at prevailing costs and to the difficulties of financing, trouble in securing materials and labor, and in the case of dwelling operations, to the uncertainty of being able to dispose of the houses in a reasonable time at the high prices that builders are forced to ask because of the present cost of construction.

The Guaranty Trust Co. of New York states there is no general expectation that by postponing new building for a few months marked savings may be realized through future declines in prices. Even should the long-desired recession in prices develop, there is said to be much ground for the belief that for some time yet building costs will show at best but slight decline apart from temporary fluctuations. It is further believed by many that there will be advances in building costs generally.

Writing on the present situation in the building industry, H. H. Fox, vice-president of the Turner Construction Co. of New York, states:

"There is no doubt whatever that the estimated costs of buildings today are higher than they have ever been. It is a fact, however, that building costs have not risen as much in the last five years as commodity prices."

In consideration of the question of the possibility of building in a year or two at materially less than could be done under prevailing prices, Mr. Fox points out that this involves two principal factors—the general price level and the demand for building construction. In view of the enormous increase in money in circulation, increased credit, etc., it seems unreasonable, he believes, to look for a rapid drop in the general price level. Regarding the demand for buildings, he states:

"From the value of building permits issued in the principal cities we find that the building work done between 1912 and 1919 was short of normal requirements by the following amounts:

1913	$ 50,000,000
1914	160,000,000
1915	150,000,000
1916	160,000,000

1917	730,000,000
1918	1,050,000,000
1919	600,000,000
Total	02,900,000,000

"This figure is still based on the 1912 cost standard. Based on present day cost, it would be over $7,000,000,000, representing more than two years' normal building construction.

"A further factor tending to increase the demand for buildings at the present time is the reduction in working hours which has taken place in many industries, necessitating a corresponding increase in working space if goods are to be produced in the same quantity.

"In the face of this condition it is hard to see how there can be any material decrease in the cost of buildings for many years, excepting as these costs may be reduced by a drop in the general price level.

"The Irving National Bank published a booklet in May, 1920, entitled 'Problem of Prices,' in which was shown the 'Federal Reserve Bank curve of production in the United States of 10 basic products.' With production in the year 1900 taken as 100 per cent, production in 1912 is shown as 160 per cent, and production in 1918 as 195 per cent. This indicates that in the years 1912 to 1918 approximately the same rate of increase was maintained as in the years 1900 to 1912. In 1919, however, the production decreased to 182 per cent. The production in 1919 was therefore below normal requirements, and if we take into account the fact that during the war years a large part of the basic commodities produced were used up in the war, there is undoubtedly at the present day a considerable shortage to be made up.

"Contrast this condition to the one which prevailed just previous to the 1907 panic. In 1906 the production of wheat was larger than in any previous year, with the exception of 1901. In 1906 the production of corn was greater than in any previous year. In 1906 the production of cotton was greater than in any previous year, with the exception of 1904. In both 1906 and 1907 the production of pig iron was greater than in any previous year. In 1906 the production of copper was greater than in any previous year.

"Therefore, the condition as to production of commodities today is so radically different from conditions which have preceded periods of depression in the past that it is difficult to believe that any falling off in demand for goods of all kinds can continue for more than a short period."

How the Federal Government Spends Its Money

An interesting report has recently appeared in the Journal of the Washington Academy of Science in which a critical study is made of the Federal governmental functions and of the amount of money devoted to each. Total figures are of no special concern in this connection, but the interesting feature is the percentage distribution of these expenditures. For the year 1919-20, 67.8 per cent of these funds are expended on account of obligations growing out of wars in which this country has been engaged. Twenty-five per cent is devoted to the maintenance of the War and Navy Departments, making a total of 92.8 per cent of the total expenditure which goes for war purposes. Three per cent is devoted to public works. Three and two-tenth's per cent is given to the maintenance of primary government functions—that is, the maintenance of the various legislative, judicial, and executive departments and offices, and only 1 per cent is devoted to all educational, research, and development purposes. This includes all of the money that is granted to various universities, museums, national parks, and other activities designed to increase the productive capacity of the people and to develop the resources of the country. Fifty dollars per catpita per year is collected for all Federal purposes, and only fifty cents per capita per year of this amount is put into research, educational, and development work. The paper in question is entitled, The Economic Importance of the Scientific Work of the Government, by E. B. Rosa.

Pittsburgh Contractor Compares 1919 and 1915 Costs

The accompanying table, comparing costs of labor and material during 1919 with those prevailing in 1915, recently appeared in The Bulletin of the Associated General Contractors of America. The data were taken from the records of a Pittsburgh contractor.

Materials—	1915	1916	1917	1918	1919	Per Cent Increase 1919 Over 1915
Brick	$7.50	$8.00	$12.00	$17.00	$16.00	113.3
Hollow tile	21.20	26.00	46.00	52.00	59.20	180.0
Foundation tile	10.00	12.00	12.00	16.00	16.00	60
Cement	1.03	1.41	1.66	2.18	2.15	108⅔
Lime	10.00	10.00	11.00	13.70	13.70	37
Sand	.70	.90	1.20	1.70	1.80	157
Gravel	.60	.70	1.00	1.50	1.60	165
Steel, structural	36.00	46.00	120.00	120.00	92.00	155.6
Steel, reinforcing	40.00	48.00	75.00	80.00	65.00	62.6
Bill lumber	25.50	28.50	30.50	38.50	40.00	56.6
Mill work, window frame, sash and rim	4.75	4.75	5.25	5.75	6.85	44
Outside door frame and trim complete	9.00	9.00	10.25	11.50	13.50	50
Inside door trim complete	5.00	5.00	6.00	7.00	8.00	60
Roofing	4.25	4.75	5.75	6.75	7.25	70.6
Hardware	335.00	482.00	624.00	663.00	632.00	88.1
Ceramic tile fl.	12.00	16.00	17.40	24.00	24.00	100
Glazed tile wall	22.50	30.00	32.50	42.00	42.00	87
Plaster paris	12.00	12.75	14.75	20.50	24.00	100
Neat plaster	12.00	12.75	14.75	20.50	24.00	100
Wood lath	5.50	5.50	7.25	8.00	8.00	45.4
C.-i. fittings	.27	.41	.49	.81	.77	185.1
Steel pipe	.22	.33	.43	.64	.56	154.5
Radiators	16.88	19.25	28.00	42.25	36.12	114
Boilers	26.68	29.60	36.80	60.00	36.80	37.8
Plumbing goods	176.00	215.00	295.00	383.00	326.00	85.2
Electrical conduit	.39	.38	.65	.875	.915	134.6
Electrical wire	.18	.26	.38	.34	.28	55.5
Plate glass	.....	12.00	15.00	18.00	18.00	50
Window glass	.....	11.00	14.00	20.00	20.00	81.8
White lead	7.75	8.75	11.75	11.75	11.70	50.9
Varnish	1.50	2.10	2.55	3.15	3.15	110
Linseed oil	.53	.67	.98	1.42	1.44	171.7
Elevators	3,720.00	4,090.00	4,500.00	7,000.00	5,000.00	34.4
Sand stone	.65	.66	.75	.75	.95	46.1
Lime stone	.71	.77	.82	1.07	1.07	50.7
Labor—						
Common labor	2.00	2.34	3.00	4.25	4.62	131
Bricklayers	5.80	6.00	6.00	6.60	7.20	24.1
Hod carriers	....	3.00	3.00	4.40	4.40	46.6
Carpenters	4.50	5.00	5.50	6.40	6.40	42.2
Roofers	4.40	4.80	5.60	6.40	6.40	45.5
Plumbers	5.50	5.50	6.00	7.50	7.50	36.3
Plumbers helpers	2.50	3.00	3.50	5.00	5.00	100
Steam fitters	5.00	5.50	6.00	6.43	7.20	44
Steam fitters helpers	3.00	3.00	3.50	4.00	4.80	60
Electricians	5.00	5.00	6.00	7.20	7.20	44
Tile setters	5.00	5.20	5.20	6.00	6.00	20
Tile setters helper	2.80	2.90	3.00	4.00	4.00	42.9
Steel workers	5.38	5.60	5.60	6.53	7.00	30.1
Hoisting engineers	5.00	5.00	5.60	6.40	6.40	28
Elevator workmen	5.50	5.50	5.80	6.30	6.60	20
Painters	4.60	4.65	5.10	5.60	6.00	30.4
Stone cutters	4.50	4.80	5.28	6.00	6.00	33.3
Stone masons	5.00	5.20	5.20	6.00	6.00	20
Stone helpers	2.00	2.40	2.60	2.60	3.00	50
Plasterers	5.62½	5.85	6.00	6.40	6.80	20.9
Hod carriers	3.20	3.40	3.80	4.60	5.20	62.5
Plaster laborers	2.00	2.20	2.60	3.20	3.60	80
Lathers	5.00	5.25	5.50	6.00	6.50	30

The False Basis On Which All Newspapers Have Been Published

(From Manufacturer's Record)

In announcing an increase in subscription rates, the Kansas City Star, a leading paper of the West said:

"Two increases in costs have made this unwelcome step imperative. The Star has just been notified of an increase in the price of print paper to take effect July 1. The amount is staggering. It will mean an added expense of $600,000 a year in producing the Star. This is merely the latest in a long series of increases. In 1916 the Star paid $42 a ton for paper. Now the lowest contract price is $120 a ton—an advance of 300 per cent.

"The second increase in cost is a new advance in postage. It will cost 11½ cents a week, for instance, to mail a copy of the Star into the third postal zone, which includes Eastern Missouri, Central Kansas and Northern Oklahoma; 16 cents a week to mail it to Colorado Springs, in the fourth zone; 18 cents to mail it to points in New Mexico, in the fifth zone; 21 cents to New York, in the sixth zone, and 25 cents to San Francisco, in the seventh. That will be a postage charge of $11 a year to New York City, and $13 a year to San Francisco.

"An advancing scale of postal rates was fixed by act of Congress three years ago. Still another advance will go into effect next year."

This brief statement tells only a small part of the hardships of all newspapers under which many must inevitably succumb. Newspaper mortality will be very heavy during the next few years.

Many years ago newspapers added the cost of postage to subscriptions, all bills carrying extra charge for postage. Later on the Government reduced the postage rate to 1 cent per pound, and all publishers immediately assumed this charge and thus reduced the cost to subscribers. A few years ago, contrary to all scientific postal management, Congress, led by men who openly proclaimed that they wanted to punish newspapers for bringing on the war—and a number of them freely made that statement to the Manufacturers Record—passed a bill for higher rates and for a zone system which has trebled and quadrupled the postage cost to newspapers, and especially to weekly and monthly publications of wide circulation. For instance, the actual postage on a copy of the Manufacturers Record to San Francisco under the advance rates is $3.82, or more than half the subscription price received.

We believe that every publication will be compelled to return to the former custom of adding postage to subscription bills, exactly as merchants add the war tax to all bills, but that will be hard on people living at points distant from the place of publication, as it will heavily increase the cost of their papers to them.

Thus, in its desire to penalize and punish newspapers, Congress will have added a burden to all newspaper and magazine readers.

Moreover, the scarcity of paper is one of the most striking phases of the nation's business life, and no publisher knows a month ahead whether he will secure a supply at any price or not. Four years ago the Manufacturers Record paid 4 cents a pound for paper, and the supply seemed without limit. Today we are paying 16¾ cents a pound, and predictions are freely made that the price will go to 25 cents. Even at these prices, no long-time contracts can be made.

business has always been on a false basis. In that re-

We have repeatedly said that the whole newspaper spect it has been unlike any other industry. Publishers have rarely, if ever, charged subscribers one-half the cost of getting out a paper, and few have ever put a fair price on their advertising pages. This point is illustrated in a letter from Mr. Bolling Arthur Johnson, editor and publisher of the Lumber World Review, to the Manufacturers Record, in the course of which he said:

"The business papers of the United States got off on the wrong foot when they began their existence. No business paper in existence today charges more than about one-half what they should have charged when they began business for the advertising space that they have been selling. Remember, now, none of them charge half enough for their space. Up to date my paper stands out above all the rest. Now let me tell you a story at the start. From the beginning my circulation ran all the way from 1800 to 2000. I decided to boost the circulation a bit and began spending about $500 a month and ran the circulation up to 2907, which it was last night. I do not believe in hothouse methods of circulation so far as business papers are concerned, but I decided to go into the hothouse scheme and did. Now, kindly remember that our circulation in the distribution all told of the Lumber World Review is 2907. We print 24 papers a year, on the 10th and 25th of each month. We get $1800 a year for a full page each issue in the front part of the paper, and $1,584 for a full page each issue in the back part of the paper—both of them publishers' option as to location. We get $200 for our front cover one time. We get at the rate of over $3000 a year for advertising next to reading matter. We get $150 for each insertion on the back cover. We get $125 for one page one time in the front part of our paper and $99 for one page one time in the back part of our paper. Think it over!

Any business paper publisher who does not know how to raise his advertising rates or who is getting a lower scale of rates than the ones I have just mentioned well needs to have a 90-day clause in his contracts, and a lot of other things which can bolster up his proposition."

Based on circulation and the frequency of publication, the Lumber World Review's advertising rates are over three times those of the Manufacturers Record and of the general run of leading industrial papers. Unquestionably, the Lumber Review's position is right, and its publisher has done a wise thing in putting his business on a strictly commercial basis, like other business organizations. On this standard the advertising rates of the Manufacturers Record should be three times as high as they are. The subscription price of business papers should also be much higher than it is, and to that they should add the war postage increase or tax, just as all other business interests have done.

These facts bear with equal force upon the entire publishing interests of the country, and sooner or later publishers must have the courage to reshape all their

business on this basis. Subscribers and advertisers must come to realize that newspapers have been philanthropists, bestowing their alms upon the country to their own impoverishment. This very fact has weakened the stamina and the independence of many publications, and thus injured the public at large by lessening the stamina, the backbone and the ability of the men engaged in newspaper work. If American newspapers are not up to standard which the business people of the country feel they should maintain, let these business men remember that the responsibility rests upon them, because they have always fought a decent living rate for subscriptions and advertisements.

Final Report on Corrosion Tests

The series of corrosion tests, which have lately been conducted in the National Lime Association laboratory to determine the effects of various materials used in construction upon reinforcing steel, have just been completed with interesting results.

A series of ten slabs of each of 14 different materials were made up, each slab having embedded in it two polished steel rods and each series being divided into two sub-series of five slabs each. One sub-series was stored in air only while the slabs of the duplicate sub-series were immersed in water for five-minute periods once a week during the conduct of the test. Slabs from each sub-series were broken and the extent to which corrosion of the steel rods had proceeded was noted at the following periods: one week, two weeks, one month, two months, and three months.

None of the concrete or lime mixtures showed any corrosion in either the air—or water-treated slabs, but in series 7 to 10 inclusive, consisting of gypsum and hydrated lime—ranging from 100 per cent gypsum to 85 per cent gypsum and 15 per cent hydrated lime,—some interesting results were obtained.

One hundred per cent gypsum, air-cured, showed a visible corrosion at the end of one week, which apparently reached a maximum in about one month due to the protective coating of iron oxide formed.

One hundred per cent gypsum, water-dipped, showed a greater corrosion than the air-cured slab, and this *kept increasing* throughout the time of the experiment.

Ninety-five per cent gypsum and five per cent hydrate, air-cured, showed no *corrosion* at the end of three months, while the water-dipped slab showed noticeable corrosion at the end of two months and visibly increased corrosion at the end of three months.

Ninety per cent gypsum and ten per cent hydrate air-cured, showed no corrosion, and the water-dipped sample showed *none at the end of two months* but very evident corrosion in three months.

Eighty-five per cent gypsum and 15 per cent hydrate showed no corrosion in either the air-cured or water-dipped slabs at the expiration of the three months' test.

These results indicate that, for purposes of preventing the corrosion of reinforcing steel, lime has a proper place in gypsum construction, the amount of lime to be used depending upon the probable amount of exposure to moisture to which the construction may be subjected.

The Association is now considering plans whereby a comprehensive and complete investigation of this subject may be undertaken so as to determine accurately the proper place of lime in this connection.

Largest Concrete Ship Built on Atlantic Coast Launched at Jacksonville.

The 7500-ton concrete tank steamship, the Dinsmore, claimed to be the largest concrete vessel ever built on the Atlantic seaboard, was recently launched at the A. Bentley & Sons shipyards, Jacksonville, Fla. The tanker, which was launched sideways, is 455 feet long and 54 feet wide, with a molded depth of 36 feet. A five-inch slab forms the bottom, while the slides or shell are four inches thick, which, compared to a wooden vessel of much less size, is said to average 19 inches less and is much lighter. The concrete is composed of finely-ground cement and special aggregate made by burning clay in cement kilns at high temperature, with the result, it is claimed, of securing concrete weighing 110 pounds per cubic foot, as against 150 pounds for the gravel and sand variety.

Power will be furnished by oil-burning boilers providing steam sufficient to drive triple-expansion engines developing 2800 horsepower.

The Dinsmore is one of several reinforced concrete constructed vessels designed and ordered by the United States Shipping Board during the war. A sister ship, the Moffitt, will be launched from the same yard in the near future. Much valuable information is said to have been gained during the construction of the Dinsmore in the pouring and handling of concrete on this class of work.

Equipment will be installed by the Jacksonville Ship Outfitting Yard and joiner work on officers' and crews' quarters, bridges, etc., was made and erected by the Campbell-Ware Company.

Concrete for Various Uses

The Portland Cement Association, Conway Bldg., Chicago, Ill., has published three valuable bulletins dealing with the following subjects: "Concrete Railway Track Support," this being a review of existing examples and of suggested designs for permanent supports of track; "Curing Concrete Pavements," which is a very useful description of how to make concrete pavements most durable: and "Concrete Highway Grade Crossings," which deals with the use of concrete instead of other paving material at railroad crossings. It is used in the form of concrete "planks," instead of wooden planks.

New Book

"Cement" by Bertram Blount, F. I. C., assisted by Wm. H. Woodcock, F. C. S., and Henry J. Gillett is the name of a new book (285 pages) published by Longmans, Green & Co., Fourth avenue and Thirtieth street, New York, N. Y. Price $6.00. Sent on receipt of price by Cement & Engineering News, 22 Quincy street, Chicago, Ill. The contents of this new book are as follows:

Chapters 1, Historical; 2, Raw Materials; 3, Fuel; 4, Manufacture; 5, Power; 6, Works Control; 7, Testing; 8, Methods of Analysis; 9, Chemistry of Portland Cement; 10, The Function of The Various Constituents of Cement.

Bungalows of Concrete Block and Stucco Attractive—Economical—Permanent

E. Conrad Carlson of Cicero, Ill., is a wholesale home builder. In the past few years he has built over 200 houses in Cicero, Oak Park, Riverside and other Chicago suburbs. Almost all are of concrete. He is now specializing on concrete block bungalows finished with portland cement stucco. This year he has built 15 bungalows in Riverside, in spite of the building tie-up which prevented operations during July and August. If the season had been normal, he would have considerably exceeded this number. The demand existed and only lack of labor and materials prevented greater output.

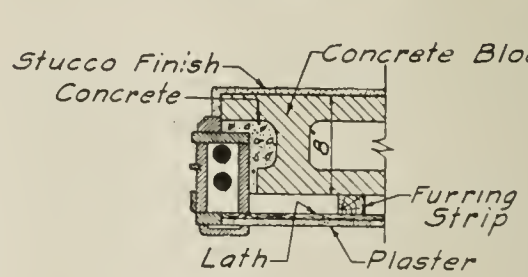
Not only are rents mounting higher and higher but the actual shortage of homes is causing hardship to many families. In a speech delivered in the U. S. Senate on August 8, Senator Calder of New York said that the country is two years behind in residence construction and that 1,000,000 new homes are needed at once. These figures are substantiated by the U. S. Department of Labor and other organizations which have investigated the need. Residence construction which was held up by the war must proceed at a rapid rate for several years if normal conditions are to prevail. To the concrete block manufacturers this situation presents an unusual opportunity for service and a chance to put his product in the lead for house construction.

Although there is a large demand in the vicinity of Chicago for two-flat buildings, Mr. Carlson confines his work to houses. He builds houses because he likes them—they are his hobby. He says: "People often ask me why I don't put up two-flat buildings. They say there is more money in them. But I stick to houses because that's the right way to live. If people own their homes you can be sure that we will never have conditions in this country like those existing in Russia today. There is a lot of good common sense behind the 'Own Your Own Home' movement and I'm going to do all I can to help it along."

Concrete block and portland cement stucco were selected by Mr. Carlson for the bungalows he is building because of good appearance, substantial construction and economy. As to the economy of concrete block, Mr. Carlson says: "My block and stucco bungalows are costing about the same as stucco on hollow tile, yet they are much more substantial. Common brick with a face brick front would cost about 10 per cent more, while face brick on three sides would cost about 20 per cent more. In making cost comparisons my bungalows should be compared to face brick on three sides because they are on large lots and the sides must be as attractive as the front. I am not using any frame construction but frame would not cost much less than concrete block."

From the standpoint of the block maker and the mason there are several good features in favor of the use of stucco. Gus. Grant of Riverside, who is making the block and doing the mason work on these bungalows, prefers this type of construction. The only care necessary in manufacture is to produce a unit which is structurally sound as no special facing is required. Slight irregularity in laying when the wall is to be stuccoed does not show, and fewer sizes and styles of block are necessary. In this case only two sizes of regular block and a water table block are used in addition to the precast lintels. Half block and jamb

Full Size Block are Easily Handled and Put in Place by One Man.



DETAIL OF WINDOW JAMB

Six-room Carlson Concrete Bungalow Ready for "Stonekote" Stucco Finish.

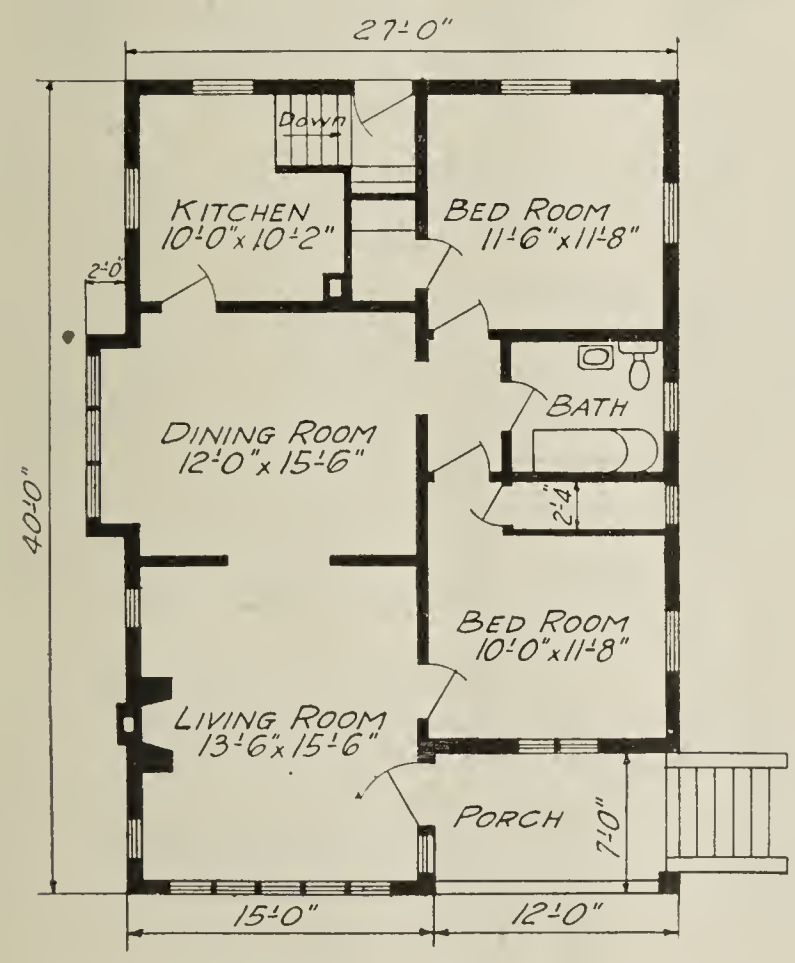
A Wide Range of Exterior Trim Makes it Possible to Appeal to the Taste by Any Prospective Home-owner.

lock are made on the job by cutting regular block. There is also an advantage to the block maker in the fact that stucco is a popular type of finish. The variety of effects which can be secured give the builder a wide range of choice in addition to the different surfaces which can be produced on unstuccoed block.

Mr. Carlson insists on good construction and has no use for the methods sometimes used in houses "built to sell." Most of his bungalows are built to order. No stock plans are used and no designs are duplicated unless the customer insists on it. Fireplaces, good plumbing, plenty of windows, concrete porches, cement asbestos shingles or concrete roofing tile, tile floors in baths and kitchens, and oak floors and trim are some of the details which are included to make each home convenient, attractive and durable.

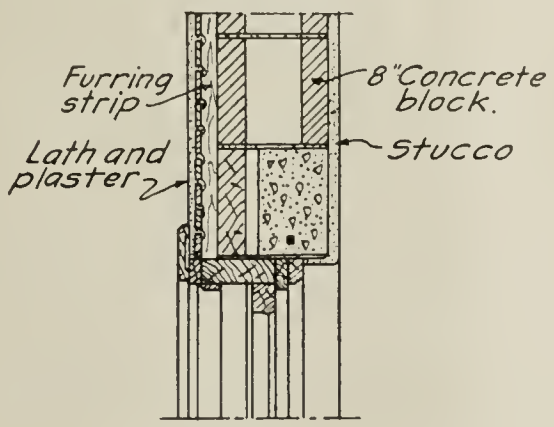
One of Mr. Carlson's "Houses Eternal"—7-room Concrete Block, "Stonekote" Stucco Finished.

Accompanying drawings and illustrations show typical details. Footings for the walls are of concrete. Ten-inch block are used up to the floor joists and 8-inch block above. There is a water table course at the ground line which projects 2 inches. At window sills, most of the houses have a belt course cast in

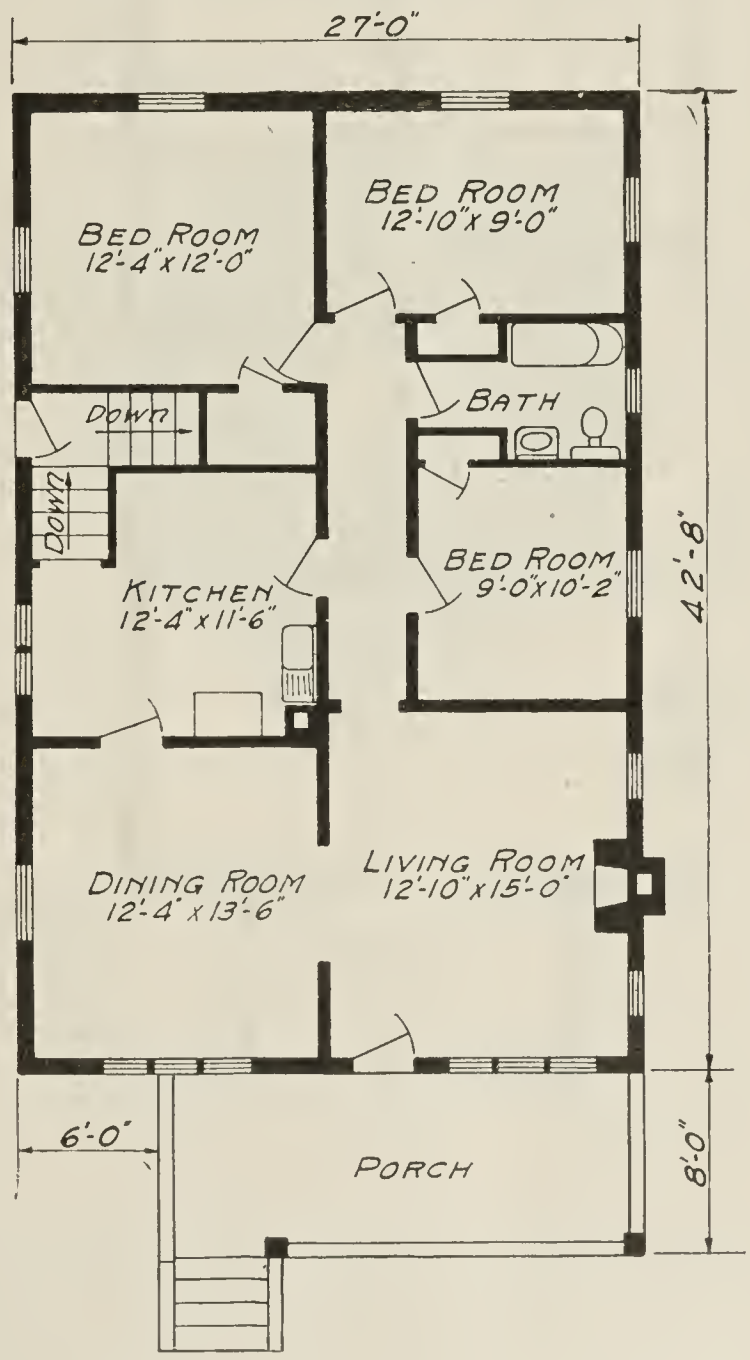


PLAN

Floor Plan of a Popular 5-room Carlson Bungalow.



DETAIL OF WINDOW HEAD

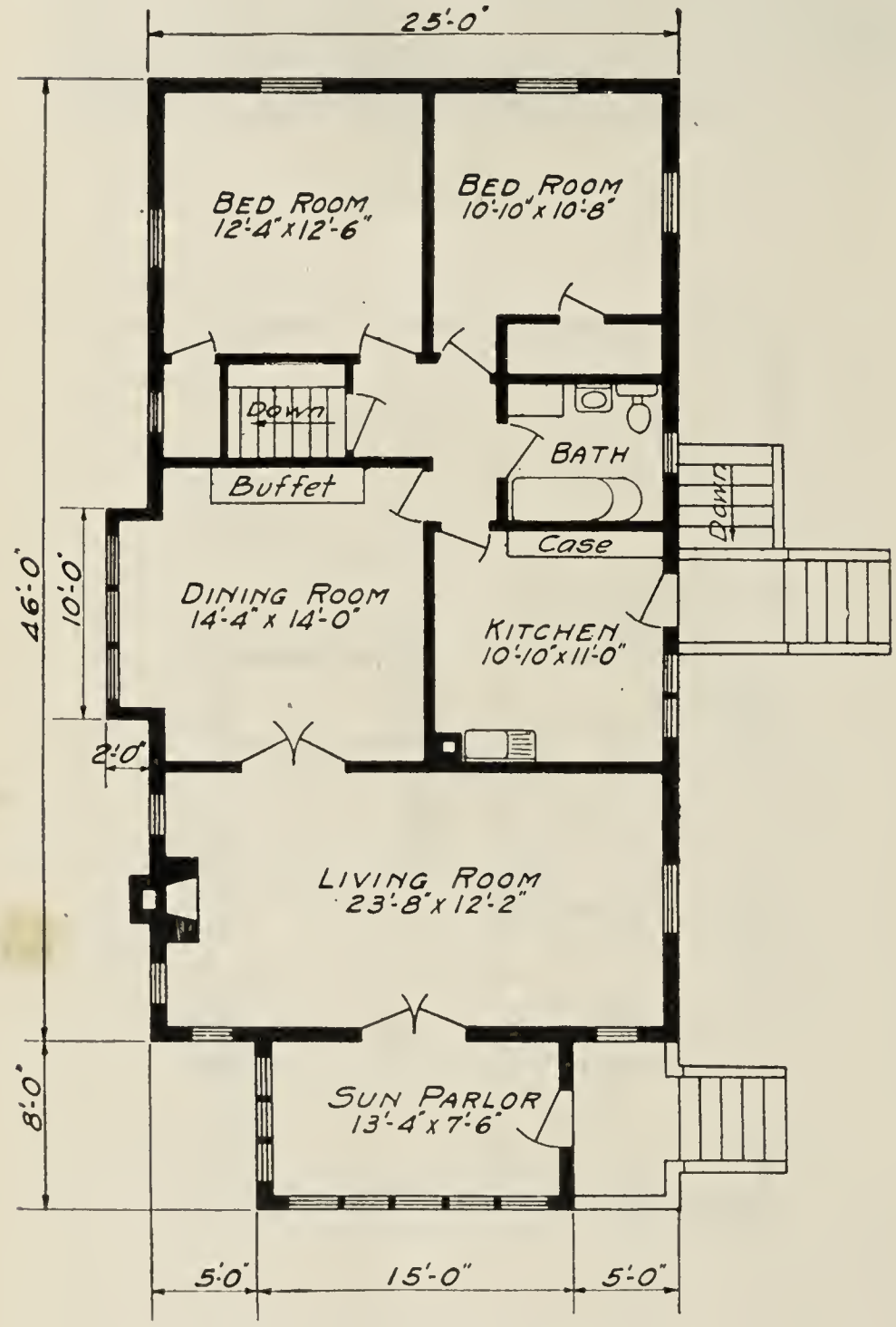


place which gives variety and also serves for window sills. The roofs are one-quarter pitch and the cornice projects 2 feet 4 inches. No attempt is made to plaster directly on the interior surface of the block. The walls are furred and lathed in all cases. This eliminates all chance of moisture condensing on the interior, and insures a structure which will be easy to heat.

The stucco is three-coat work. Very attractive effects are secured by using different color combinations together with sand-floated, rough-cast, or dry-dash finishes. The dry-dash is similar to pebble-dash except that crusher granite or micaspar, instead of peb-

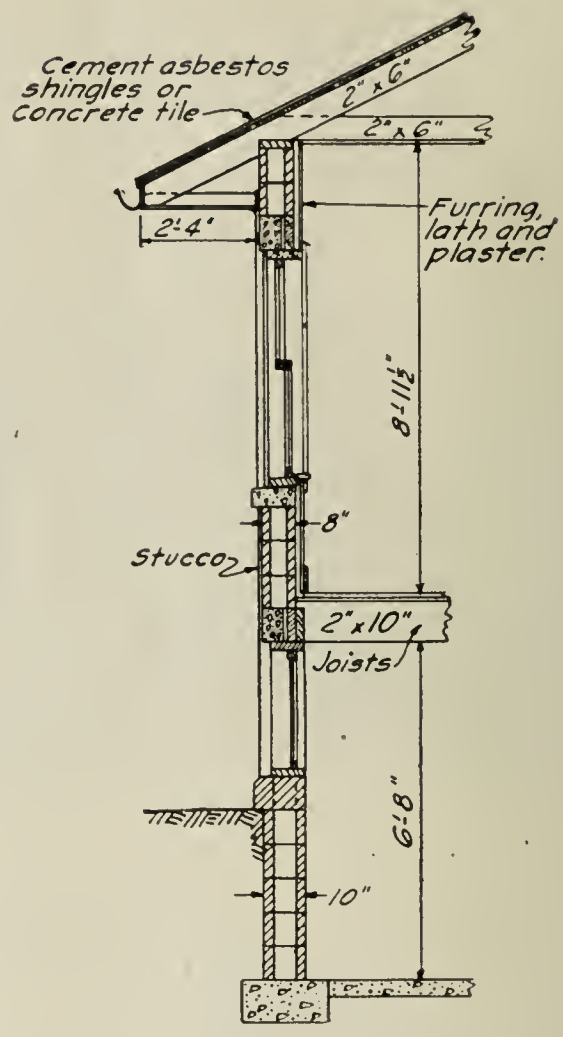
bles, is thrown against the final coat. In some cases micaspar is used above the belt course and red granite below.

The scratch and second coats are mixed in the proportion 1 sack cement to 3 cubic feet of sand with 1/10 of a cubic foot of hydrated lime. Both coats average ⅜ inch thick. The finish coat is a ready mixed portland cement stucco known as "Stonekote." manufactured by the Garden City Sand Co., Chicago, and is about ¼ inch thick. Before the scratch coat



is applied, the wall is wet thoroughly in order to prevent the block from absorbing water from the stucco and the scratch and second coats are also wet before succeeding coats are put on. In order to further assist in securing a good bond between successive coats the surfaces of the first two coats are roughened or scored. The second coat is applied the day after the scratch coat, but a week is allowed to elapse before putting on the finishing coat. This reduces the possibility of cracks to the minimum and with care in other particulars insures a first-class job.

The work of Mr. Carlson and Mr. Grant should be an inspiration to every block manufacturer. It shows what can be done with block in producing attractive, fire-resisting, economical, and durable homes, and points to an unusual opportunity for the use of block in relieving the house shortage.



New Book on Concrete

"How to Use Cement for Concrete Construction for Town and Farm," is the title of a new book just issued by Stanton & Van Vliet Co., 501 Plymouth Place, Chicago, price $1.00. The author, H. Colin Campbell, is an expert engineer who has made a special study of concrete. He was for many years in the service of the government and is now on the staff of the Portland Cement Association as director of the Editorial and Advertising Bureau, in which capacity he has had unusual opportunities for obtaining the most authentic information concerning this subject, and in producing a book of this nature we consider ourselves fortunate in getting Mr. Campbell to undertake the work for us.

This is an unusually valuable addition to our mechanical line and covering, as it does, concrete construction for both town and farm, there is a vast field for the sale of such a book. Retail book dealers will find in it a book that supplies a long felt want among builders and others who are interested in concrete since, so far as we know, it is the only book on the market today that covers cement and concrete construction in all its phases. It not only tells of the different kinds of structures that can be made of concrete but IT TELLS HOW TO MAKE THEM.

And not to builders alone in this book of inestimable value. It is unquestionably the most authentic reference book published on this subject and as such should be in every library in the country.

As a text book for manual training schools, it has no rival. The instructions are explicit and easy to comprehend and the 250 drawings and photographs which Mr. Campbell has provided to illustrate the different kinds and stages of concrete construction enable the student to clearly and readily understand the instructions given.

Link-Belt "Lettgo" Mechanical Overload Release

An effective "safety-first" mechanical device that will instantly disengage a drive when the load exceeds a predetermined point, has been developed by the Link-Belt Company. It is known as the "Lettgo" Mechanical Overload Release. It is especially adaptable for elevating, conveying, and power transmission machinery.

The "Lettgo" will automatically disengage the driving from the driven machinery if the load exceeds the fixed amount, thus allowing the driving motor or other source of power to run free and prevent damage, due to the inertia of the motor armature or other high-speed moving parts.

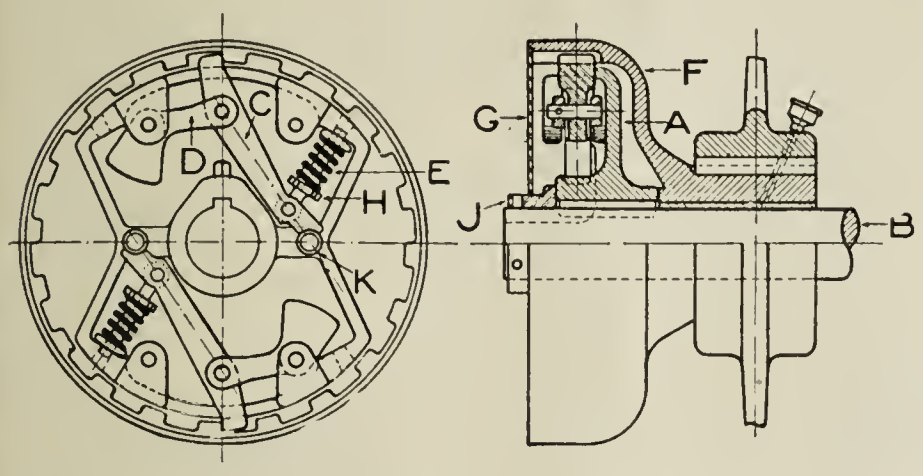


Fig. 1.—Diagram Showing Construction of "Lettgo" Mechanical Overload Release.

The spider A, keyed to the shaft B, has triggers C pivotally mounted on the links D, with the ends engaging inside notches in the rim of the drum F, and rollers K. The springs E, regulated to any desired pressure by the adjusting nuts H, hold the ends of the triggers on the rollers K, under normal conditions, but when the drive is overstressed, the compression of the springs will permit the ends of the triggers to drop into the position shown in the enlarged section, releasing connection with the rim F, and allowing the driven machine to stop immediately.

To set the triggers again in the driving position, the collar J is profided with fingers that engage the pins on the lower ends of triggers C. By turning this collar with a spanner wrench, the triggers are moved to the original position, and the outer ends at the same time enter notches in the drum F, thus re-establishing the transmission connection. The cover G, fitting the end of the drum F, incloses and protects the entire mechanism. The hub of the drum F may be extended to receive a wheel or gear, and have a bushing for running loose on the shaft; or may be keyed directly to a separate shaft, thus forming a coupling device, in which either element may be the driver.

The construction of this device is such that it will release whether the load is gradually or suddenly applied, but it can be set so that it will not trip from jars or shocks.

The "Lettgo" is symmetrical, and can be assembled to operate in either direction. It can be adjusted for tension, so that it will operate for any desired overload. The mechanism is entirely inclosed and can be packed with grease for lubrication purposes.

Being positive in its action and easily reset, the Link-Belt "Lettgo" has distinct advantages over the "break pin" or similar devices.

Fig. 2.—How Device Operates When Disengaging a Drive.

Fig. 3.—As it Appears When Not in Service.

For Users of Portable Conveyors

Contractors and manufacturers who need conveying machinery for their activities will find interesting data with accompanying photographic views in a catalogue issued by the Portable Machinery Co., Passaic, N. J. This publication tells of that company's specialties in portable conveyors, including a scoop conveyor which permits of materials being scraped immediately on to the carrying belt instead of being lifted into the hopper. Thousands of the company's equipments are being operated in many different industries under varying conditions, and they are constantly in demand by people who investigate these important devices for effective time and labor saving, therefore saving money in handling various materials. The Portable Machinery Co. offers its devices for storing, reclaiming and loading coal and coke, ashes, sand, gravel, crushed stone, fertilizer, cement, chemicals, etc. Write them for Catalog No. 95.

Broken Bolts and Screws

Trouble Caused by Broken Foundation Bolts, Studs, Bolts and Fittings Results in a Loss of Time—Only Remedy to Such Mishaps Is to Be Ready to Meet the Emergency

By CHARLES LABBE
Mechanical Engineer, Johnnie, Nev.*

Very troublesome are foundation bolts broken off flush or inside of the concrete foundation; additional strain cannot always be imposed on the other bolts to hold for the missing one, and the repair must be made. In many of these foundation bolts no provision is made in case of break; they are grouted or cemented so tight that no one can tell how far down they extend.

Repair of Broken Bolts

Two of the foundation bolts of a large compressor broke, one flush with the concrete, the other about 10 in. in the concrete. The bolts were 1¼-in. mild steel and the break was caused by flaws.

The first broken bolt was center-marked with a center punch and a ¼-in. hole was drilled about 1½ in. deep, to keep the larger drill in the center of the bolt and from running into the concrete. The bolt was bored first with a ⅞-in. drill to a depth of 6 in., then bored with a 1¼-in. drill to a depth of 4½ in. The drill shavings were taken out with a curved piece of iron and a magnetized round file. The ⅞-in. part of the hole (Fig. 1) was tapped out of 1-in. standard bolt thread and a piece of 1¼-in. soft steel turned down and threaded to fit in the bolt, and the upper part threaded for a 1¼-in. nut.

For the second bolt a piece of 1-in. pipe was forced in the hole in the concrete to guide the drill in the center (Fig. 2). A 1-in. drill was first used, drilling to a depth of about 1 in. to give a start for the tap and a center for the ⅞-in. drill. The hole was drilled and tapped like for the other, the 1-in. pipe left in place and sawed off even with the cast base and a 1-in. stud of the required length was made to fit. To insure a permanent tightening the threads of the lower part were washed with gasoline and smeared with a mixture of sal ammoniac (by weight) 2 parts, flour of sulphur 1 part, wet iron filings 100 parts. The studs were made tight in place with double nut.

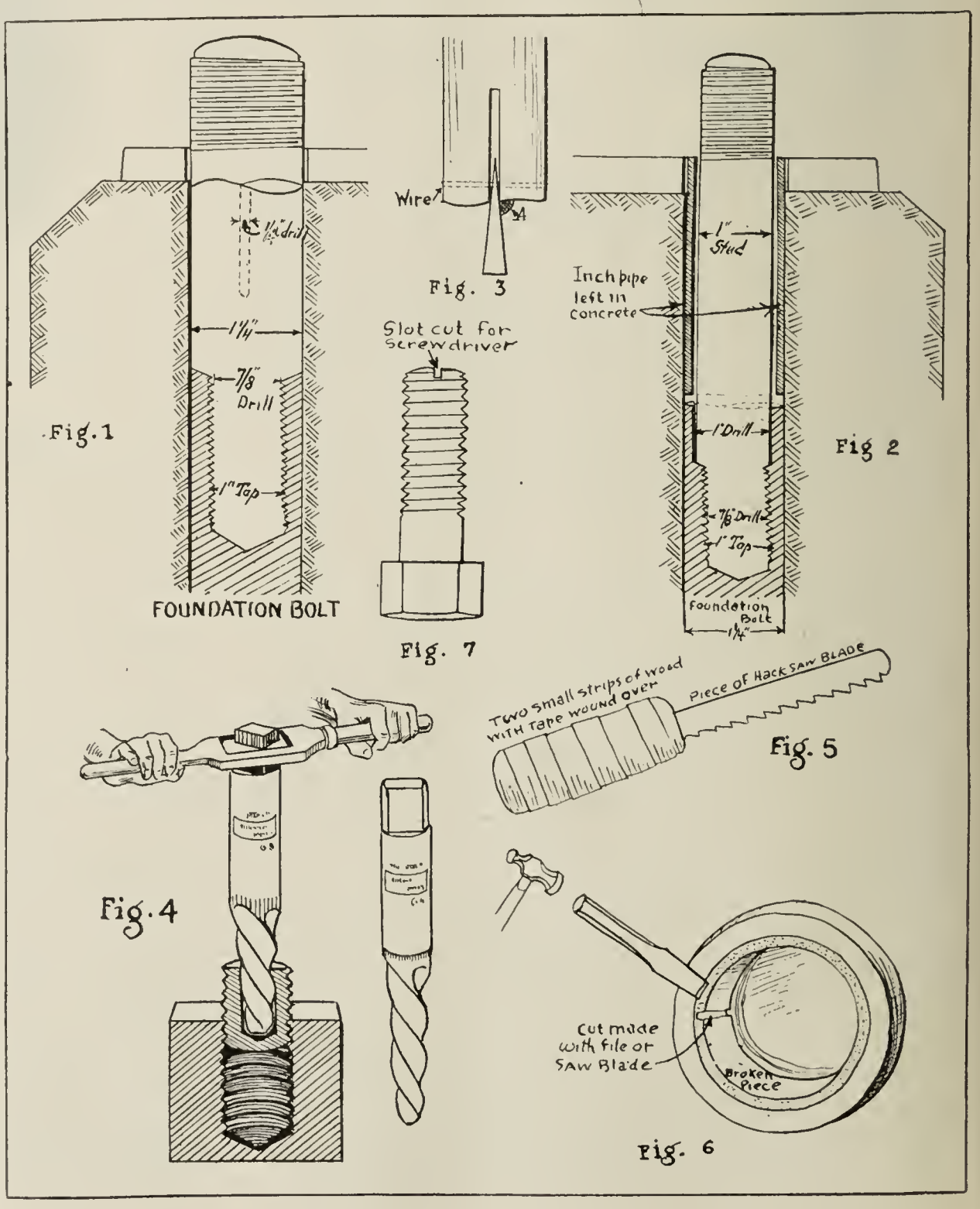
When a foundation bolt held by a cast washer in the concrete breaks off right at the head it is taken out, split with the hacksaw at the broken end, annealed and an iron wedge made (Fig. 3), the bolt being driven back into place. The grip is made by driving the bolt over the wedge, thus spreading the end. If there is danger of the wedge dropping off before the rod reaches its place, solder the wedge at "A" or drill a 1/16-in. hole through rod and wedge and put a piece of copper wire through; either will part at the first blow when hammering the rod with the wedge resting on the bottom.

In case of emergency a hole could be drilled in the concrete with the jack-hammer, next to the casting to a depth of 20 to 30 diameters, and a bolt set in with a plate on the top, but this would not look very artistic in a modern power plant.

Broken Studs

In machinery broken studs are taken out by drilling a hole slightly smaller than the inside of the threads and cutting the remaining loose threads with a narrow cape chisel or by using a tap of the thread size. If the stud breaks off somewhat away from the casting, put the blowtorch on it for a minute or so to get a trifle dark red and while cooling put engine oil around it; some will work into the threads, the expansion and contraction will also help to loosen it up, and by using a small pipe wrench on the projecting part of the stud it will come out.

Studs or set screws twisted off or broken can be unscrewed in the shortest time by using an "Easy-out" screw extractor; this is a tool made in different sizes



*Written for Rock Products.

especially for that purpose (Fig. 4), a hole is drilled in the screw, the tool slightly driven in and with a tap wrench just unscrew the piece out. Those tools cost from 50 cents to a dollar, according to size, and often pay for themselves at the first use.

Sometimes broken studs, large ones mostly, are unscrewed with the help of a diamond-point chisel and a hammer.

Pipe Fittings

A common occurrence of broken pipe threads is often met with in fittings; to remove the few threads left depends mostly on the accessibility of the pipe. A cut is made on the inside of the broken piece with a small sharp-edged file or a tool made with a piece of saw blade (Fig. 5) and two strips of wood, held by wrapped tape. Hammer slightly around the fitting and with a cape chisel (Fig. 6) hammer one side in and the piece will come out easily. After taking out a broken piece it is advisable to run the tape in, or a nipple, to smooth any roughness and clean the threads before screwing in the new piece of pipe.

Cap Screws

In engines, pumps or compressors often one of the cap screws holding the connecting rod's adjusting wedges breaks, either in running or in making adjustments. A very good way to do before putting in these capscrews is to cut a slot for a screwdriver at the end of the small part (Fig 7), so if one part breaks the other can be taken out by a screwdriver inserted in the hole and the broken piece screwed out. This ought to be done by the builder and not the repairman.

In case of a broken cap screw in the connecting rod at the crosshead end, the pin must be taken out in order to move the connecting rod to get room to remove the screw.

In the engine room there ought to be kept on a board, wired or nailed, extra gaskets and cap screws to duplicate those on the engine which are liable to break. I have seen more than once a pump or compressor stopped just long enough to take up the bearings, when a cap screw would break and by the time another was found or made, the department waiting wondered "when the strike would be called off."

Cap screws as taken from the stock are far from perfect, the head is quite small, and the material is generally a cold-drawn steel which twists off easily. They are somewhat crystallized and their service on moving parts is more dependable if they are annealed.

Improvised Thread Cutter

I remember of a shipment of 1¼-in. anchor bolts sent up into the hills, separate of nuts. When the nuts were tried on, they would not start; by measuring we found that the bolts were 1/32-in. oversize and the nuts standard size. There were no dies nor a lathe to turn the threads down so we resorted to the following emergency. The threads were filed down with a flat file and by using a three-wheeled pipe cutter the threads were cut deeper. For a die one nut with six grooves cut with a thin, flat file and case-hardened with cyanide and a little sal ammoniai and dipped in salt water (everything to get all the hardness possible) was used.

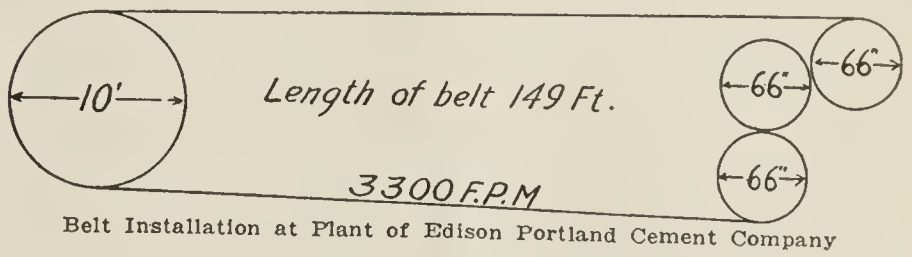
For all studs and screw ends made on the lathe, turn down the first thread; it will be so much easier to start the screw or nut straight. If you hammer the end a little it will not batter up the first thread, and will add much to the finished appearance. Also cut down the first inside thread (large end) of a pipe fitting. It is of great help if someone has to hold the pipe, and there is much less chance of starting cross-thread.

Friction Surface Belt In Cement Plant

Many times, the question has been brought up by the different cement plant operators over the country, whether a rubber friction surface belt was ideal for cement plants. Before this question can be intelligently answered, consideration must be given to the construction of the belt and the duty it is called upon to perform.

Friction surface belts differ from the ordinary canvass rubber covered belts, inasmuch as the rubber is pressed into the meshes of the fabric under extremely high pressure, insuring a complete covering for every thread. This also binds the piles together and tends to make the belt unified.

Opportunity is afforded in the construction of friction surface belts to reduce the stretch to a minimum when cured in the press.



Belt Installation at Plant of Edison Portland Cement Company

Due to the waterproof construction and the elimination of stretch during the manufacture of these belts, very little trouble has ever been encountered by having to "cut out."

These qualities are quite marked and enjoy a long interrupted service in many plants.

The sketch shows an installation of a friction surfaced belt installed as a result of a plant analysis by one of the belting company's technical men, at the plant of the Edison Portland Cement Company.

The belt is installed on an Edison Giant Roll from engine drive shaft. Due to the nature of this drive, both sides of the belt are constantly in contact with the pulleys. Severe flexing of the belt on this drive necessitated a belt which is limber, will conform to the shape of the pulleys readily, and has a tensile strength sufficient to carry the load.

The service which this belt is called upon to do is quite severe. Every operator knows the exact duty of the roll, and knowing its intermittent service will not hesitate to say that it is a hard drive.

The horse power required on this drive is about 300. Material to be crushed is very hard limestone.

The belt must withstand the action of dust and falling pieces of rock, which is thrown from the crusher between the belt and the pulley.

Only one "take up" has had to be made since its installation on August 15, 1918, and is still in service at the present time.

Belt applied was 28-inch width, 7-ply, 149 feet long. There is a 45 degree angle of incline from an overhead drive. The belt was fastened with a Vim splice.

F. D. Coppock on Industrial Relations

The following paper was submitted by F. D. Coppock, President of The Greenville Gravel Company, Greenville, Ohio, at the Convention of Sand and Gravel Producers

"The views which I express in this are the result of my convictions formed during the past seventeen years of constant contact with labor and from different positions, as laborer, as foreman, superintendent, and finally as an employer.

"I believe that the great army of employers in the country, regardless of the number of men they employ, and the nature of labor to be performed will soon realize the necessity of greater industrial democracy. The absence of personal consideration, the lack of contact and interest in the simple everyday affairs of the employed, the social distinction exacted by the employer, are labor's excuses for the lack of real interest in the affairs of the employer. It must be obvious therefore that the responsibility of the resulting dissatisfaction and unrest falls on the employer. It is natural that if we treat laborers as mere tools without any interest in their personal affairs, that they in turn will treat us as a machine, and without any personal interest in our affairs.

Labor and Investment Contrasted

"Did you ever stop to think how much we catered to bank officials in order to secure the use of $25,000 in money? At six per cent this money costs you the same per day as one laboring man. The laborer is just as essential to your operation as the money. This is one way to determine the value of labor.

"An organization employing twenty men to carry on its operation should consider the securing and retention of this labor fully as important as the borrowing of $500,000, because that is exactly what the men are worth, measured by the fact that we pay the men their labor as much as we pay for the use of the money. Believe me, we would palaver and cater to every member of a banking organization from the janitor to the president that would lend us this amount of money for use in a plant requiring only twenty men. We would be playing five-hundred with the cashier's family, golf with the president, and poker with the Board of Directors. We would go out of our way to extend pleasant greetings and be nice to them; we would drop in to see them personally on matters which might have been attended to by 'phone or letter —we would never think of sending a time-keeper or an office boy to see them. We don't need to borrow $500,000 to run one of our plants, but we do need the twenty men; yet, how much consideration do we give them, how often do we go out of our way to accommodate them or to please them?

Importance of Personal Contact

"I am convinced that if it would be possible for employers in the gravel game and other industries to realize the importance of personal contact with their men, that they would decide this to be the cheapest and most effective method of avoiding labor troubles. Why not take a day off now and then for the purpose of looking over the operation, and shake hands with these fellows, and why not make the common laborer feel that you have as much interest in him as you expect him to have in your business? Inasmuch as gravel operations do not require a large number of men, such a practice would require very little time; in fact, not as much as we devote to the cultivating of the banking bunch. How much more does one of these laborers prize a handshake with you and your solicitous inquiries as to his family than do those bankers! It is an easy matter to make a man yours for life by a little personal interest, and it is not necessary to renew a contract with him every ninety days as with the banker.

"I think that we should inaugurate and encourage the practice on the part of our management, supervision and foremanship to become more interested in labor and to systematically and religiously cultivate a friendlier and closer relationship to it; and my advice to employers who have not the time to personally give attention to this important phase of operation, would be to employ someone whose business it would be to carry to his labor his good wishes, to investigate their personal likes and dislikes, and learn something regarding the families of the men, to attend to their needs and comforts and to make them, through this evidence of real personal interest, closer to his organization, and to feel that 'big family' loyalty.

Selection of Foremen

"The choosing of a foreman or supervision is a very important thing. We should select men as nearly as possible who are considerate, reasonable and yet firm, men who reflect our ideas in dealing with labor. A common mistake is that of employing some husky doublefisted fellow as foreman, who feels that it is his duty to drive his men and to emphasize his position by being rough and dictatorial. The foreman, in dealing with labor, is our direct and constant representative, and we should tell him just how we want him to treat our men, and see to it that he carries out our policies.

"I am not a believer in Darwin's theories, and yet I am convinced that men have certain animal traits, especially more or less ignorant classes. I have experienced the same results in dealing with certain laboring men as I have with my Scotch collie.

"A common saying is that the more you kick a dog, the more he likes you. This is not true, but it goes to show how much kicking the dog will stand for after you have made a friend of him and a home for him. Did you ever try kicking a strange dog? Don't do it, for if he is a worthwhile dog, has any back bone or get up about him he will bite you, or at least snarl and growl. I believe the same thing applies to men. We want a man with a back bone, and admire those who stand up for their rights and have self respect enough to at least want to be treated fair.

"As a usual thing our dogs, at times, get a lot of attention—we pat them on the back, caress them etc., and they seem to realize the condescension on our part and in return for this personal interest, they form a love and attachment for us that you can't kick out of them. The trouble is that we don't treat our laborer with the same expression of friendship and kindness that we do our canine friends. We growl and kick a lot at the laboring men, but we forget that they are strange dogs. This is just my way of emphasizing the value of personal contact, and I beg the laborer to pardon the comparison.

Looking After Physical Comforts of Men

"Other than to encourage this personal interest by our management and supervision, we are doing a few things which we have found advantageous. At one of our plants we have a small hotel, large enough to accommodate sixteen men, equipped with comfortable beds, bath and toilet, lounging and reading room, with plenty of good reading matter. Have a family to manage and look after the rooms, board the men and run a commissary. We have tried to furnish every convenience to offset every excuse for their going to town. If we can keep these men from town, they are

not so apt to be tempted by offers and bids from other employers. This bidding has created a lot of discontent and turn-over in pay rolls. At other plants we have trucks to haul the men to and from work, charging the man an amount per trip to offset the upkeep of the machines. We have built houses at some of the plants which we rent to the most important of our men. We have encouraged and assisted others in the purchasing of their own property. We have never refused a man aid when he was sick and have helped him to get all possible out of the Indemnity Insurance in case of accident.

Profit Sharing

"I do not believe in profit sharing with the laboring man in the commonly accepted interpretation of the term, inasmuch in my opinion such a practice would have a tendency to give certain firms a monopoly on labor because of patent rights, governmental protection, etc., which permit them to make out of their operation fabulous profits. Profits are not equal in all lines of business, even where the same number of men are employed. Profits are not the same at one gravel plant as at another, and I think the profit-sharing practice would tend to make labor in general discontented—some would be well paid while others would not. I do not think the profits earned by the company should be a measure, as I do think a man should be paid proportionately who exerts an earnest effort and manifests an interest regardless of the profits earned by the concern employing him.

"We do this in the manner of profit sharing: We employ plant managers on small salaries—small when you consider their position and ability—and then allow them a per cent of the net earnings on their operations. We do this in order to encourage their interest in profit making. Managers interested in salaries only are too apt to want ideal equipment and arrangements regardless of the practical application of such investments. We charge to the individual account of the manager the invoice price of all material condemned in order to prevent them from loading beyond the capacity of their plants. We emphasize the importance of properly made materials and good service to prove to them wherein these are of more importance than immediate profits.

"Another thing which we do in order to encourage the personal interest of managers, salesmen and, in fact, all that are connected with our general office work, is to sell to them on easy terms of settlement, amount of our common stock is held by active mem- some common stock in our company. A considerable bers of our organization.

Bonus Systems

"As to the bonus plan. I think that a plan designed to allow a per cent of the total amount paid an employe during the year, possibly at Christmas time, or at the end of the year, would be the means of encouraging labor to stay with you. It would assist materially in preventing turn-overs in labor, and would be looked upon by them as a gift and personal remembrance rather than an arbitrary sum to which they are entitled.

"I have suggested that our company put into effect January 1, 1920 the following plan: The allowing of five per cent of regular pay for all employes, regardless of the rate paid, who are with us for one year, this bonus to be increased ratably for five years so that at the end of the fifth year of continuous employment, the employee would be given twenty per cent per year on the total of his regular pay as a bonus. In other words, the five dollar man would get at the end of the first year about seventy-five dollars, at the end of the second year one hundred and fifty dollars and up to three hundreds dollars at the end of the fifth year. Experienced men are worth much more than the inexperienced.

"This may be considered as an indirect way of sharing profits, and I am of the opinion that it will not only encourage personal interest, but it will anticipate and prevent demands for increases in wages and assist in solving other problems which will in the end more than offset the cost to the company.

Value of Personal Contact

"One further thought in conclusion. Permit me to emphasize the value of personal contact between the employer and employee, the value of our handshake and good wishes, the value of courteous and yet firm treatment, and why, in my opinion such a practice is the very highest type of profit sharing.

"After all is said and done, profit, which represents a sum over and above the regular salaries, is worth only the comforts it can buy. One of the greatest comforts in the world to the laboring man is the personal interest in him of his employer. One of the most potent causes of great discontent and unrest among labor today is the great social gap between employer and employee, a condition for which the employer alone is to blame. The employer who holds himself aloof from his labor and fails to bind his labor to him with human interest, but emphasizes the social difference between them, makes his labor more disatisfied and envious. This dissatisfaction and envy gradually grows into a feeling of hatred, and his whole object is to oppose rather than promote the success of the concern. Unfair unions, strikes and labor troubles in general are the fruits of his envy. In a way the laborer is a victim of circumstances pretty much controlled by the employer and in my opinion he will be just what the employer makes of him.

"Never in the history of the our country has the necessity been so apparent for the cultivation of a closer intimacy between employer and the employee. I believe that the most important duty of the employing class of today and the most effective is to foster a friendlier relationship with labor."

Concrete House Construction

An official report of the proceedings of the National Conference on Concrete House Construction, which was held at the Auditorium Hotel, Chicago, on February 17, 18 and 19 last, has been issued from the office of the secretary, A. J. R. Curtis, 111 W. Washington St., in that city. It makes a substantial book of 235 pages which are full of important and interesting material of great value to everyone concerned with the use of concrete for the erection of buildings. It contains many illustrations accompanied by complete descriptions, and there are also numerous diagrams showing details of construction. Various types of concrete construction are considered, and the data presented is extremely enlightening and practical. A picture of especial interest is one on page 116, showing the residence of reinforced concrete which was built at Port Chester, N. Y., by W. E. Ward in 1872, nearly half a century ago and which, it is stated, is still in excellent condition, giving "every evidence that the end of the next 50 years will find it in the same condition as today." Another illustration shows a group of concrete dwellings at Allentown, Pa., which were erected in 1880 and which are apparently as good as the day they were completed.

A Modern Sand and Gravel Handling Plant

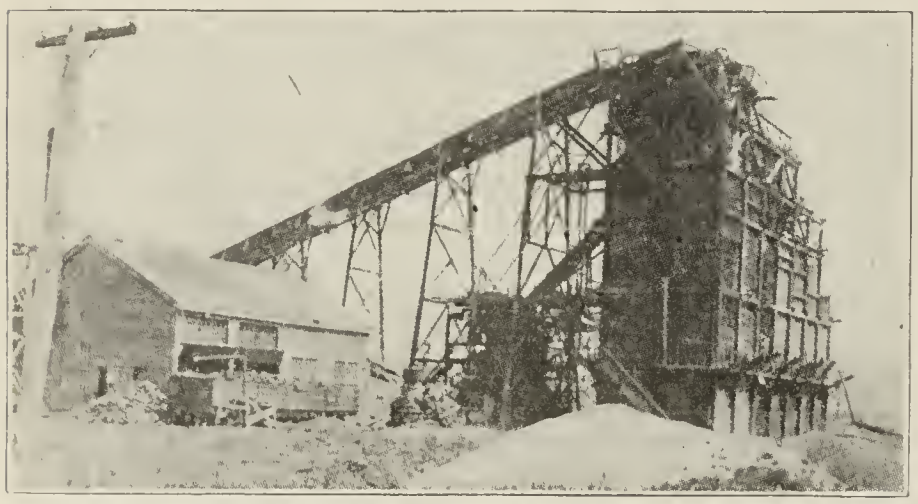
The Lakeshore Sand Company's plant at Algonquin, Ill., is a model of its kind and is perfectly equipped to produce the highest grade of washed sand and gravel.

The plant covers 140 acres and has a daily capacity of 60 cars of screened sand and gravel, with ample storage space. Its pit averages 40 to 45 feet of face and in the bottom there are 4½ miles of standard gauge railway track. The plant is designed for winter work as well as summer, being equipped with drying screens. Sand known as Nos. 1, 2 and 2½ Torpedo; concrete aggregate Nos. 5, 6, 7, 8 and 9 are produced.

Stripping is accomplished with a Page dragline having an 85-foot boom and a 2-yard bucket. The top soil is about 7 feet deep and is thrown into the excavated pit by the dragline. This machine, of course, is stationed on the top of the bank. Working in the bottom of the pit is a steam shovel with a 2½-yard dipper which transfers the exposed gravel into center-dump gondolas of 100,000 pounds' capacity, built especially for this purpose after designs supplied by the sand and gravel concern. One loaded gondola is pulled to the foot of the inclined elevator by a standard gauge locomotive and dumped into a hopper beneath the track. The company has three such trains. This hopper holds one full carload and feeds onto a belt line elevator 325 feet between centers consisting of a 36-inch Goodrich belt traveling on roller equipment.

Interesting Screening System

At the top of the inclined elevator the material passes over the pulley and goes directly to three-in-one cylindrical screens having 2½-inch, 1¾-inch and 1¼-inch perforations. The material retained on the first, or 2½-inch screen, is spouted to two No. 5 gyratory crushers and one 36-inch Symons disc crusher in a building adjacent to the screening plant. From these crushers it is carried by a 28-inch conveyor belt to the main elevator leading from the bottom of the pit to the top of the plant, and again goes through the cylindrical triple screens already mentioned.



The Material is Conveyed to the Screens by a 325-foot Belt Elevator. The Oversize is Crushed by No. 5's on the Ground and Returned to the Big Incline.

The material rejected by the second screen (1¾-inch perforations) is chuted directly to the No. 9 bin, although provision has been made for recrushing should demand make it necessary.

The sand and smaller material go to a pair of screens underneath the triple screens and at right angle to them. Up to this point no water has come in contact with the material and it is in these two screens that the water is added. These are conical in shape, 48 inches and 42 inches in diameter at the ends, 8 feet long. The material which does not go through them is called No. 8 and ranges in size from 1¼ inches to ¾-inch. It is chuted into the No. 8 bin.

The material passing through these screens goes to another pair of screens underneath with perforations ½ and 7-16-inch. From these screens the retained material goes to bins, and the sand passing through is delivered to settling boxes from which it drops into bins.

Plant Has Two Loading Tracks

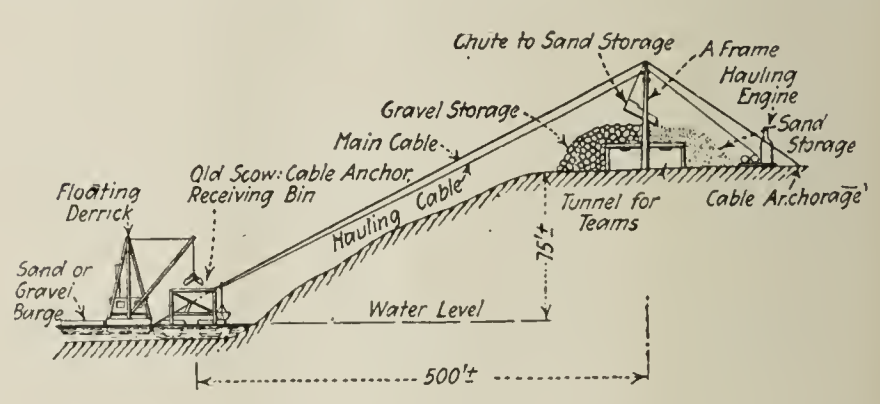
There are seven bins in all, with a total capacity of 20 carloads. Railroad cars are loaded from spouts by gravity, there being loading tracks on two sides of the plant. Shipments are made over the C. & N. W. Ry. The general car shortage has seriously affected the plant's operations, as it has all other sand and gravel and crushed stone producers. At present only about 13 empty cars a day are being received, when 60 are needed.

Provision has been made for storing dry material by means of a conveyor belt 24 inches wide traveling on a trestle and taking material from the No. 8 bin. This belt is parallel to the plant and unloads at its yard end.

Plant for Sand and Gravel Storage

By George W. McAlpin, Point Pleasant, W. Va.

Unloading Ohio river sand and gravel from barges and storing them at the top of a bank so as to be accessible to teams and trucks, is successfully handled by the plant shown in the accompanying sketch. This plant was designed and installed by the Western



PLANT UNLOADS AND STORES 50 CU.YD. PER HOUR

Rivers Co., Point Pleasant, W. Va. Sand and gravel have been unloaded and stored at the rate of 50 cu. yd. or more per hour. An old dump scow, sunk in the river to a chosen point, just below mean water level, furnished anchorage for the outer end of a cable-way rig, and also supported a loading hopper. The other end of the main cable was carried over a simple A-frame at the top of the slope, and anchored to a dead man. Sand and gravel, transferred from barges to the hopper by a floating derrick passed into a bucket, operating on a cable-way with a single hauling line and no hoisting, or main-fall line. The bucket was brought to the top of the slope and dumped by a small two-drum hoist. Upon reaching the frame the bucket engaged the end of a short chute, placed between the legs of the frame, and discharged directly into the storage pile. To dump into the gravel storage a trip line was attached to the bucket to overturn it at the desired point. The bucket returned to the foot of the slope by gravity. Tunnels, through storage piles, fitted with bin gates, permitted ready loading of trucks and wagons.

The Quarry of the Riverside Cement Company

Among the many cement companies, who are striving to keep up with the great and growing demand for their product, is the Riverside Portland Cement Company, whose plant is situated just outside the winter resort town of Riverside, California.

The company has an almost inexhaustible quarry above and a half mile back from the mill. Formerly, the stone was hauled in dump carts, and dumped upon a conveyor, which took the material to the crusher. One hundred head of stock were used in this hauling. Later an enormous jaw crusher was installed and Western Dump Cars were substituted for the carts, greatly increasing production and enabling the work to be done with about one-tenth the men. The cars are of 12-yard capacity and look as if they have seen very heavy service, and they have, for they helped build the New York subways before going into the cement business. The Riverside people heavily reinforced them with steel and have kept them hustling ever since.

General View of Riverside Cement Plant. Crusher on Extreme Right.

Interior or Crusher House: Hopper Leading to the Great Jaws of the Crusher on the Right. Trains of 12-yard Dump Cars Loaded with Stone, are Dumped, one at a Time into this Crusher.

Two steamshovels are operated in the quarry, one of them against a face of solid rock, 80 feet high. For blasting, a round of ten to fourteen holes are sunk with cyclone drills and 300 pounds of dynamite sent off at each shot.

One of Several Huge Kilns Through Which the Cement Passed.

Conveyor by which the Crushed Stone is Carried out into Piles. A Return Conveyor Below Carries it Back to be Pulverized when Needed.

The broken rock is loaded into the dump cars, for a half mile haul to the plant. The train is run into the crusher building and dumped, a car at a time, into

the huge jaws of the crusher, which can take care of very large pieces of rock. The crushed stone is carried out on a conveyor and loaded into piles, from which it can be dropped by gravity on to a returning conveyor. Back in the plant again, it is elevated to another crusher and crushed to the consistency of flour, the pulverized limestone passing from there to the kilns. Oil is used for fuel, 6½ tank cars of oil being consumed every 24 hours. The plant has a capacity of 6,500 barrels of excellent cement daily.

The officers of the company and plant are: W. G. Henshaw, of Oakland, president; John Trainor, of Los Angeles, manager; Earl McDonald, superintendent; S. T. Henshaw, assistant superintendent.

Concrete Fence Posts of Quality

Success in any business is based on the production of quality products. Products of quality depend on the use of proper esuipment, methods of manufacture and good materials. The manufacture of concrete fence posts is no exception to the rule.

In addition to knowing how to make first class concrete fence posts, the manufacturer must know their merits so as to convince prospective purchasers of same.

Molds form a very important part of a fence post maker's equipment. They should be of a material which does not warp, shrink, crack or absorb, the form oil which is necessary in concrete work of this kind. Steel is the material which answers the requirements satisfactorily and mold makers in general use steel in the manufacture of their products.

Aggregate for concrete should be clean and well graded and mixed with enough cement to form a strong concrete. Only enough water should be used as will produce concrete of a plastic consistency, such as is workable by the method of manufacture employed. Concrete mixtures may range from 1 part, by volume, of cement to 4 parts, by volume, of aggregate down to 1 part cement and 3 or 3½ parts of aggregate. The grading of the aggregaate will determine the proportioning necessary.

Plastic concrete mixtures are usable in molds which are subjected to vibration for consolidating the concrete. The W. E. Dunn Mfg. Co., 414 24th Street, Holland, Mich., has developed a system of manufacture in which steel molds and a vibrating frame are used to good advantage. The quality of posts made by this method is evident from a study of the test report reproduced herein.

It is evident that a fence constructed with such posts and the proper wire fencing will be a pig tight, horse high and bull strong. Tests such as were made on the Dunn posts would give post makers data which will prove the merits of well made concrete posts. It is obvious that a post capable of standing so successfully the strains imposed in the test were made of the proper material, in good molds, by efficient manufacturing processes and well cured to develop the strength of the cement content.

Concrete products should never be sun-dried, but should be cured under conditions of warmth and moisture which will assist the chemical action necessary for the hydration of portland cement.

Normal consistency concrete will contain enough water for the hydration of cement and must remain in the post or other product until hydration is practically complete. Steel molds prevent evaporation of water on the surfaces covered by the steel and does not permit water to percolate through or to be absorbed by the molds. Steam curing is always advisable and if not used the posts should be protected from the direct rays of the sun and from warm dry air currents which would induce rapid evaporation of moisture from the exposed surface of concrete.

Another instance indicating the recognized merits of well made posts lies in the use of Dunn concrete posts by many railways and by several cement manufacturing companies. A post good enough to fence railroad rights-of-way and to fence in the property of cement mills should be good enough for any other fence where permanency, fire proofness, rot proofness and good appearance are desired.

AGRICULTURAL ENGINEERING EXPERIMENT STATION PROJECT.

No. 20. Farm Fences.
Sub-project b. Fence Posts.

Date, April 23, 1915.	Age of post, 294 days.
Post No. 583.	Shape,
No. of reinforcing bars, 4.	Kind of reinforcing, ¼" sq. twisted.
Placing of reinforcing, ½".	Weight of post, 125.5.
Weight of concrete, 119.41.	Weight of reinforcement, 6.09.
Length of post, 7'-6".	Size at bottom, 5½.
Size at top, 3½"x3½".	Vol. of post, .82.

Load on scale 4" from top of post.	Total load 2'-6" from base of post.	Deflection.
60	191	.0
110	350	.0
160	510	.0625
210	670	.0937
260	830	.1250
310	957	.1075
360	1,150	.250
410	1,310	.3125
460	1,470	.4062
510	1,620	.50
560	1,785	.6875
585	1,865	.875
610	1,945	
Max. 620	1,975	

Kind of failure—Tension wires broke.

Persons contemplating the manufacture of concrete products should first consider the demand which exists or can be created for such products. Second, they should consider the various items of equipment necessary to manufacture the products economically. Manufacturers of machines and all incidental plant equipment will gladly give information regarding their goods. Third, the prospective manufacturer should determine whether or not his capital is sufficient to install good, modern and efficient equipment. Last and not least, materials and labor must be readily available at costs which are not prohibitive.

Protected from nature's elements, properly used in manufacturing processes and cured so the cement will hydrate thoroughly, portland cement becomes the servant of man and serves many useful purposes ever increasing in number.

THE BUCYRUS COMPANY

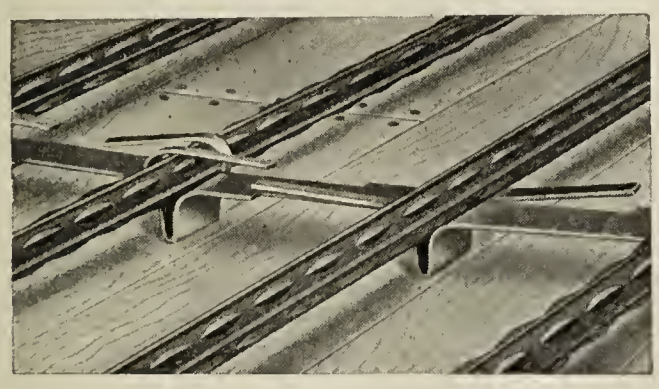
Mr. E. G. Lewis, formerly manager of the Cleveland office of the Bucyrus Company, has been appointed central sales manager of this company, with headquarters at 622 McCormick Bldg., Chicago. He will succeed Mr. E. C. Hingston who has resigned. The Cleveland office which was opened by the company on Sept. 1st, 1919, will be continued under Mr. Lewis' jurisdiction.

Added Strength in Concrete Structures is Insured by Proper Placing and Securing the Reinforcement

Architects and engineers spend much time in detailing and laying out a building for public safety and the owners satisfaction and to properly bring these aims about contractors should follow out these details and design.

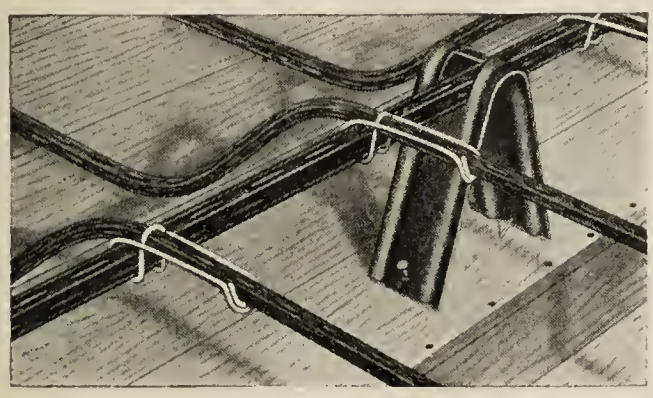
And to properly follow out these details and design economically and speedily is for the contractor's gain.

In the reinforcing end of the building there is a place for every bar and each bar should be quickly and properly located in its position so that same will not



SLAB BAR-SPACER
For supporting and spacing bars in the slab.

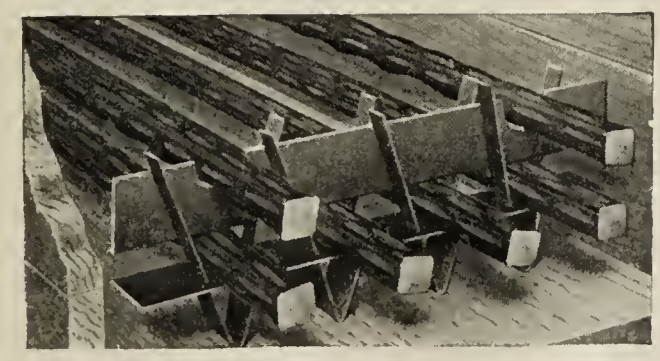
be disturbed prior to or during concreting process and to reach this aim devices like the Havemeyer Hy-Chair, Securo Bar-Spacer and Beam-Saddles may be suitably employed.



HY-CHAIR
For supporting head rods over column heads and for over direct bands in flat slab and bent bars over beams in beam and girder construction.

The Hy-Chair holds the supporting rod over the column heads or over the direct bands in flat slab or over the beam in beam and girders which supporting rod in turn holds up the bent up bars in the slab. Hy-Chairs are nailed to the forms thus insuring its original position and the head rods are locked to the Hy-Chair by prongs. Bar-Spacers will properly support at any given height the slab bars as well as space them accurately and lock them into position by self contained prongs and the Beam-Saddles will perform similar functions for the bars and in the beams and girders.

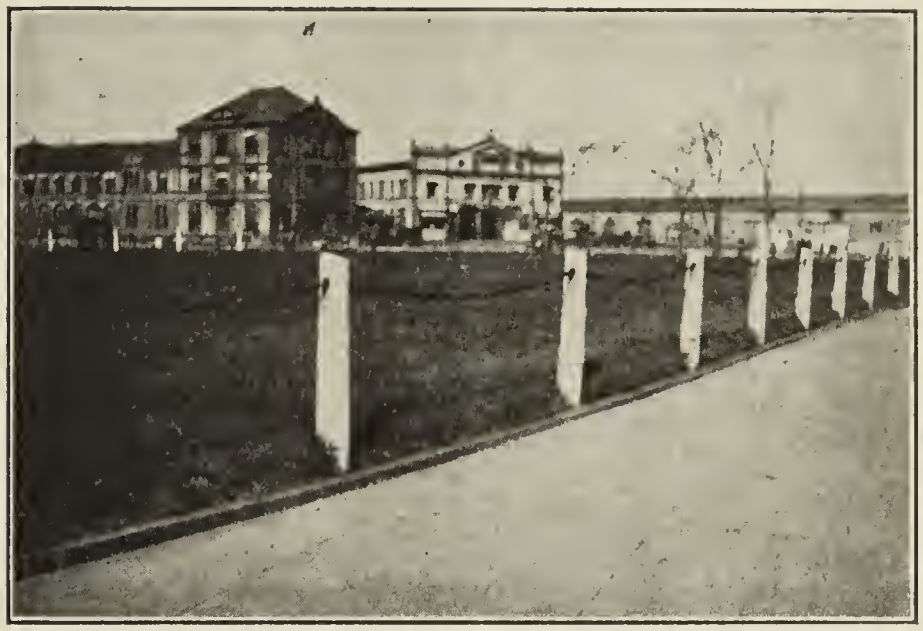
These devices are made up on order by the Concrete Steel Company, at Chicago, Ill., and Camden, N J., and detail sheets or placing diagrams accompany each order.



BEAM BAR-SPACER
For supporting and spacing bars in beams and girders.

Opportunity for More Business

Every concrete products manufacturer can enlarge his business and increase his profits by making articles for which his plant is suitably equipped. If he is now manufacturing concrete blocks, silo staves, drain and roofing tile he can easily produce ornamental concrete fence posts which are readily sold to cities, towns and



Concrete at the Gateway of the Nation—Concrete Fence Posts in Battery Park, New York.

cemeteries, for permanent, useful and decorative purposes.

The illustration below shows a type of concrete fence posts used by the Park Department of the City of New York. Some of these fence posts are placed in such a conspicuous location as Battery Park. They resemble wooden posts very closely and beautify this well-known landmark.

Making Concrete Without Sand

Concrete used by the Ottawa Improvement Commission, Ottawa, Canada, for retaining walls, fence posts and lamp posts, is made entirely without sand. The mixture, which consists of cement and crushed stone of different sizes and shades, makes a concrete of a very pleasing appearance, and one which is remarkable by the complete absence of surface cracks and the changes of color often noticed in some concrete work. Such concrete can be made into a variety of colors by using different kinds of stone.

Bilger Steel Forms for Concrete Culverts and Bridges—The Highway Culvert Form Co., Peoria, Ill., announces in this circular the development of the Flat-Top form in addition to the Arch form for the construction of monolithic culverts in nine sizes from 12″ x 18″ to 12′ x 10′. The forms are made of steel angles and plates in collapsible outfits in nine foot lengths.

News of the Cement Mills

At a meeting recently held by the stockholders of the Signal Mountain Cement Company, a newly organized concern in Chattanooga, Tenn., which is capitalized at $6,000,000, the following officers were elected: R. C. Lubins, president; J. P. Hoskins, treasurer; and Ralph K. Law, secretary. The original stockholders were elected directors of the big concern.

A large amount of the stock issued by the concern will be placed on the local market and, according to reports, it will not be long in being subscribed, as inquiries from local financiers are daily being received.

The past three months have been busy ones at what was once the Western Portland Cement Company plant, five miles west of Yankton, South Dakota. Six carloads of machinery, all that is left of the old plant, stands by the track side awaiting cars for shipment to Ohio. The Sandusky Cement Company, now the owner, which concern at first intended to operate the plant, suddenly decided to dismantle the whole plant.

The Great Western Portland Cement Co., Mildred, Kansas, is enlarging and improving its plants in every department. The wet process is used. Hand quarry loading operations will be replaced by steam shovel.

The Alsen Cement Co. at Alsen, N. Y., will be enlarged in every department next winter. The company will expend $200,000 to improve the plant so that its capacity may be brought up to 4,000 barrels a day. In view of the enlarged capacity to follow the improvements, an order has been placed for a new crane to cost $35,000, according to a local report.

Prospects are bright for establishing a cement plant near Buffalo, Iowa, by the Davenport Cement Co., Davenport, Iowa, organized by Max E. Ochs, R. B. Cook and E. L. Cox, who was formerly sales manager of the German-American Portland Cement Co., LaSalle and Chicago, Ill. This is indicated by the favorable result of the drilling which has been in progress since June 1. Tests of the rock obtained on the 400-acre tract made by Robert W. Hunt & Co., engineers, Chicago, show limestone of a very superior quality and present in sufficient quantities for the manufacture of cement.

The Monolith cement plant, Monolith, Calif., which is undergoing repairs, will be ready for operation by October 1. Repair gangs are being enlarged daily, although great difficulty is being experienced in securing cement workers of experience. A large steam shovel will be purchased at a cost of $12,000 to replace large gangs which it would be necessary to employ at the quarries.

Charles Reuss, formerly electrician at the Monolith plant and now connected with the electric department of the city of Los Angeles, is at the cement plant for a few days assisting the new management.

Articles of incorporation of the Inter State Portland Cement Company, Des Moines, Ia., were filed in the office of the county recorder. The authorized capital stock of the company will be $3,100,000. Its first set of officers will include: Parley Sheldon of Ames, president; L. K. Nichols, vice president; W. B. Barney, vice president; Paul W. Carroll, secretary and treasurer; George Cosson, general counsel, and B. F. Carroll, chairman of the board.

The Coosa Portland Cement plant at Ragland, Ala., has been purchased by Geo. E. Nicholson, Commerce Bldg., Kansas City, Mo. The first kiln will be placed in operation within thirty days and the second kiln within thirty days thereafter. A larger crusher has been purchased. Probably the plant will be enlarged a little later, but no definite announcement can be made just at this time. The Hunt Engineering Company will have charge of the work.

Joseph P. Day, sole agent, 67 Liberty St., New York, N. Y., has for sale a completely equipped cement plant, capacity of 2,000 barrels per day, located at Stockertown, Pa. Includes 69 acres. Large cement quarry, deep face.

A plant which may prove one of the largest industrial enterprises of the city was added to Chattanooga's list of industries last month, when application for a charter for the Signal Mountain Portland Cement Co. was filed. The charter calls for an initial capitalization of $6,000,000. Incorporators of the company are R. C. Lubiens of Iowa; C. E. James, Chattanooga financier; A. Y. Jameson of Mason City, Iowa, and C. A. Lyerly, J. P. Hoskins and W. A. Sadd, local bankers. Organization of the company will probably be perfected early next week, when officers will be elected.

The new company has purchased the site of the proposed James steel plant at the foot of Signal Mountain, about five miles from here, together with 600 acres of limestone land. Construction of a gigantic plant, which will start operations with a capacity of 3,000 barrels of cement a day and be increased to 5,000, will be begun as soon as possible. The plant will be ideally located within a stone's throw of all needed raw materials. Negotiations have been completed for coal from mines within a few miles of the plant. The plant will be managed by George P. Deickmann, manager of the Gulf States Portland Cement Co. at Demopolis, Ala. Mr. Lubiens, together with other Western capitalists, will be the chief stockholders. While several stockholders of the local company are owners of stock in the Gulf States company, the two plants will be run independently.

It is reported that the Gulf States Portland Cement plant at Demopolis, Ala., will build a two-million-dollar addition to its plant. Announcement is made by the company officials.

The new unit to the plant will have an output of 2,500 barrels of cement per day, making the entire daily output of the plant 3,500 barrels. This does not include the agricultural lime made by the plant.

The company now has in operation a cement and carbonate of lime plant value at $2,000,000. The output of the plant is hauled to Mobile by water, and practically all of it is handled through local dealers.

Lack of facilities in getting the product to market now is the only thing that is delaying the company in constructing the additional plant. The company is unable to get freight cars, and its only outlet is by shipping its product by river. Official announcement

is made that as soon as the company is assured that the Government's barge line is able to take care of the additional freight the new unit to the plant will be constructed.

Present cost of handling the cement is about $1 per barrel in excess of what it will be when barge-line facilities are available. Poor means of handling the freight to the boat, delays from various causes, crude barge facilities are given as causes for the excessive cost. The rail rate is much lower than the present water rate, but the plant is unable to get cars from the railroad.

As a result of using interurban transportation between its cement mills at Speeds, Ind., 12 miles from Louisville, and its warehouses in Louisville, the Louisville Cement Company has been able to supply the J. B. Speed Company, its selling agent, representing a subsidiary company, all of the cement needed.

When car shortage became bad during the war period, and priority orders interfered with shipment, the company started trucking cement by road, but found that the expense was enormous. A round trip represented a 25-mile haul, and over roads which were not the best. This was very hard on trucks, and far from satisfactory

The company then made arrangements with the Louisville & Southern Indiana Traction Company to haul cement on flat cars from the mills at Speeds to a siding in Louisville. In damp weather the cement was covered with tarpaulins. Solid trains of three cars of cement were brought down at one time and placed on the siding, where they were transferred to trucks for local delivery either on the job or to the warehouses.

The company has since secured a lease on a warehouse building adjoining the traction company's car barns, and plans to unload directly to this platform and carry a stock of some 1,500 barrels on hand.

In order to render better service in bad weather the traction company is now building some box cars which will be used in handling the cement, and has also ordered some larger and more powerful motors, which will make it easier to handle heavier trains.

Sidings at Speeds, Ind., have been improved to reduce handling and save time. Shipments leaving the mills are in Louisville in a little over an hour, ready for unloading.

The company claims that the cost of transportation by interurban is slightly under the cost by steam rail, and far under the cost of motor-truck transportation. The speed made between the mills and local siding is also far greater. In the days when steam lines were depended upon, cars were often delayed in the yards for days at a time before being switched and spotted.

As a result of using electric railway transportation the company has been enabled to run its mill at a good steady clip; the only difficulty has been in securing coal for operation of the mills.

The Link Belt Company, 910 South Michigan Avenue, Chicago, Ill., advise us that they will gladly send any of our readers a copy of the new book No. 345, entitled, "Link-Belt Silent Chain Drives for Cement Mills." The Link-Belt Company declare every cement mill man should have this book "as Link-Belt silent chain is the ideal drive for cement mills. It is compact, flexible, durable, 98.2 per cent efficient, and combines in one drive the best points of flat belts, rope drives and gears, without their disadvantages." This book shows how many cement mills throughout the country are now using Link-Belt silent chain drives.

The plant of the Lehigh Portland Cement Company, Metaline Falls, Wash., has been closed down for the purpose of making extensive repairs.

The Societe Generale Meuliere, La-Ferte-sous-Jouarre (S. & M.), France, are doing business with quite a number of the American cement manufacturers and mining and chemical companies. They sell first class silex slabs for lining tube-mills. Their product has successfully passed some of the most severe tests and is known for its long life. They can make immediate shipments on stock sizes and would be glad to have cement manufacturers write them for their prices, which are considered moderate.

Cement Demand in Texas Far Exceeds Supply

Many samples of cement and cement materials are being received for the purpose of testing at the laboratory of the Bureau of Economic Geology of the University of Texas. According to G. A. Parkinson, assistant testing engineer of the bureau, enormous quantities of cement are now being used in various lines of construction work in the state. The demand for the product exceeds the supply, and considerable shipments are being received from plants outside of the state. The purpose of the tests which the bureau is making of the samples of cement is to determine whether they come up to the standards required. They are sent in principally by highway engineers and others who are interested in construction work.

An investigation is now being made by a committee appointed by the legislature at its recent special session of the alleged combination of the cement manufacturers of the state by which, it is asserted, there is an agreement as to prices of the product. Highway construction engineers are aiding in this investigation.

"There is need at this time of an additional large cement manufacturing plant in Texas," Mr. Parkinson said. "There has been some talk that the state should own and operate such a plant under the direction of the State Highway Department. There is undoubtedly a shortage of cement in Texas at this time. It is impossible to obtain the product from abroad, as was the case in pre-war days. It was thought that cement might be obtained from Spain, and that it could be laid down in Galveston at a price which would make its importation advisable. It has been found, however, upon investigation that the prices that would have to be paid for cement in Spain make it impracticable to import the product.

"There are abundant deposits of cement materials in Texas. In the laboratory of the Bureau of Economic Geology samples have been tested and they have proved to be of high grade. In the chemistry division of the bureau a small plant has been installed for the manufacture of cement under the direction of Dr. E. P. Schoch. Samples of material received by the bureau may be tested in the laboratory plant and their content determined."

More concrete highway construction is now in progress and proposed in Texas than ever before known. It is also to be noted that much attention is being given to the building of permanent concrete bridges and culverts. Another source of demand for cement is that of building concrete cattle-dipping vats. Hundreds of these dipping vats must be constructed in order to comply with the law for the eradication of the cattle tick. Many dams for the storage of water for irrigation and municipal supply purposes are also being built of concrete. The use of this material for business and residence building purposes is constantly increasing in Texas, it is stated.

News of the Gravel and Crushed Stone Plants

The Greenstone Products Co., 971, Roanoke, Va., are building a complete new plant at Deerfield, Md., to have a daily capacity of 1,000 tons slate granules. Two gyratory crushes, one 20 inches and one 8 inches and four sets of heavy duty rolls made by the Traylor Engineering & Mfg. Co., Allentown, Pa., are being installed. The size of the plant building is 176x62x82 feet and 45 feet high.

The Carnegie Steel Co. recently purchased a Bucyrus 103-C steam shovel for use at their Youngstown, Ohio, slag pit.

Construction has just been started at Rockland, Me., on what promises to be one of the finest lime plants in the country if not in the world. Rockland lime has been famous on the market for years. Now it is to have a new boom, for many thousands of dollars are to be spent by the Rockland & Rockport Lime Company immediately. The foundation, now under way, will be 25 feet deep and 50 by 30 feet, on which will be erected a "jaw crusher" having an opening to admit any stone measuring 3½ by feet or less. This crusher will weigh 175,000 pounds, and will have a flywheel eight feet in diameter. The capacity will be 200 tons of rock an hour. The total capacity of the storage bins will be 1,200 tons.

By the elimination of hand breaking no larger number of employes will be needed. There are now about 475 men at the plant. The output will be increased 25 to 30 per cent with a perfected system of sorting of sizes. The machinery is expected this month, so that the plant should be in operation before the end of September. The changes will include ten new steel fireproof kilns, where the rock will be burned with a gas flame, to eliminate smoke. Each kiln will have a capacity of 35 tons a day, or an aggregate output of 350 every twenty-four hours. The new kilns will be 87 feet magazines from which the rock will be fed into the kilns. A traveling ship hoist will rise 110 feet, and will be operated electrically.

Under the new system there will be no "drawing" of red hot lime. This will enable the company to keep up with its orders in the winter as well as the summer. The capacity of the hydrate mill will be doubled. Now 4½ tons an hour is the output.

Quite recently there was a deal put through at Fair Haven, Vt., whereby the Vermont Milling Products Corporation of Boston, were purchasers in one of the biggest slate deals in the history of the state, and incidentally launches the building of the largest manufacturing plant for the production of slate granules for roofing material in the country. The deal is said to involve approximately one-half million dollars.

The above company plan on locating in their territory about two miles west of Fair Haven—a one-half million dollar mill, that, when running to capacity, will turn out 500,000 tons of finished product each year; daily output of ixty cars of slate granules.

The construction of the new mill is now under way, and the machinery for the same, we understand, is being furnished by the Allis-Chalmers Company. The excavating of this material will be done by two Class-45 Atlantic-Type Shovels recently purchased, and in all probability will be loaded into ten-ton cars.

The financing of the deal is in the hands of Barstow, Hill & Co., investment bankers of Boston and Springfield, Mass.

The treasurer of the Vermont Milling Products Company is Stowell H. Bancroft of Boston. This company own and control approximately 150 acres of land underlain with slate, literally an inexhaustible supply.

For the past twenty-five years operators of Vermont, where this plant will be located, have been furnishing slate shingles. The reject from the quarry in operation has accumulated, and some of the dumps are 50 feet high and contain several million tons. It is the intention of the new company to utilize some of this excavated material for the purpose of manufacturing slate granules.

Mr. R. H. Townsend, general manager Beloit Limestone Company, Beloit, Wis., recently organized, writes us that their pulverized limestone is considered the best in the country, testing 96 to 98 per cent of calcium carbonate by state analysis.

A. J. Sullivan and H. L. Peaslee, formerly of the Unted States Crushed Stone Company, announce that they have recently organized the Inland Crushed Stone Company, 139 N. Clark St., Chicago, having acquired a thoroughly modern stone crushing plant at Joliet, Ill.

The Elkhart Sand & Gravel Co., Elkhart Lake, Wis., operate three crushing and washing plants using Champion crushers, also one sand pit and one ballast pit. Excavating and loading is done by Sauerman dragline cableway excavators. Their new sand and gravel plant will be ready September 1. The company has recently increased their capitalization from $100,000 to $200,000.

At the Mechanicsburg, Ohio, plant of the Greenville Gravel Company, a Westinghouse type C. W. motor of 100 horsepower capacity, installed in 1915, operates two stone crushers, one Symons disc crusher and one gyratory crusher. The engineer in charge says that, in spite of silicate dust that usually pervade the air of the crusher room and that settles in all corners, the brushes have not had to be replaced since installation.

The Central Texas Gravel Company operate a modern, up-to-date gravel pit twelve miles north of Dallas, using a Bucyrus 14 dragline, equipped with a two-yard dipper. They report splendid business and bright prospects.

The Bettendorf Stone Company, Davenport, Iowa, operate quarries at Bettendorf, Ia., and Moline, Ill., daily capacity 700 tons. They have two No. 5 Austin gyratory crushers and a Williams pulverizer and expect to increase their capacity in the near future by installing steam shovels and more crushers.

The Lone Star Stone Company of Chico, Tex., is operating a 95-ton Bucyrus shovel in their rock quarry at that place.

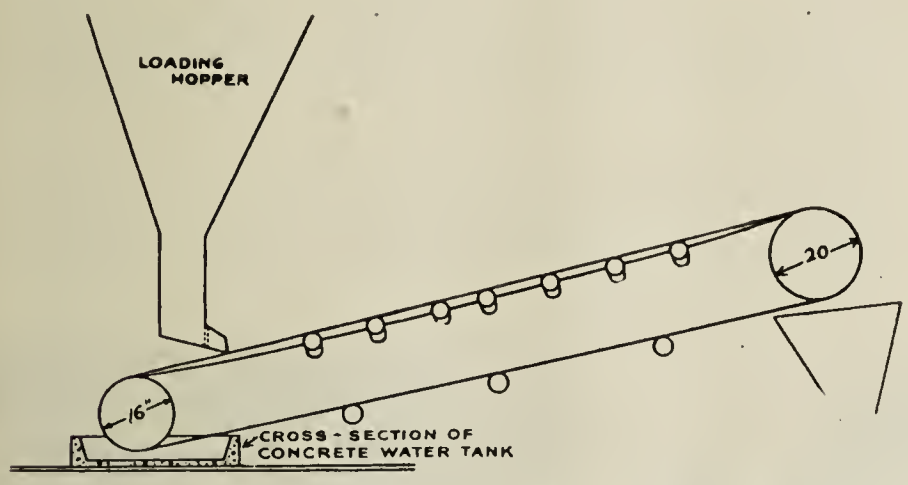
The Johnstown Slag Company, Johnstown, Pa., have begun operation of their new slag plant at that point. The slag is from the Cambria Steel Company and is dug by Bucyrus 70-C shovels and loaded in twelve yard all steel dump cars and hauled to the crushing plant when the metal from the slag is reclaimed by electric magnets.

Non-Destructive Method of Belt Joining Helps Big Cement Mill Solve Unusual Problem

An unusual problem in the handling of hot cement clinkers with a temperature of 200° and over, was recently solved at the plant of the Standard Portland Cement Company, Leeds, Ala., in an interesting and cost-reducing manner.

The method decided upon for moving the clinker was a rubber conveyor belt, but the clinker could not be cooled sufficiently in the process previous to conveying to prevent scorching of the belt and its rapid destruction. The answer to this problem was found by running the belt at an incline of 12°, so that the lower pulley dipped into a trough of water, thus carrying a film of cold water upon the belt, on to which the hot clinker from the loading hopper was deposited.

At this point a new problem was encountered; namely, how to join the belt so that the belt's full strength would be retained, and in a way which would withstand the extremes of temperature, the wear on the pullefs and the abrasion of the clinker. For this purpose Crescent Belt Fasteners were adopted, because they brought the belt ends tightly together in a snug joint, which made the belt practically endless



Outline o f Conveyor Belt in Cement Mill. Total Length 72'—2". Head Pulley 20"x18". Tail Pulley 16"x18"

on the pulley side, so there was no opportunity for clinker ash to get into the joint and abrade the belt ends, and also because in this method of joining, no metal came in contact with the pulleys to cause wear, and a permanent joint was thus assured. Moreover, the exceptional strength of the heads of the Crescent Rivets and the formation of Crescent Plates prevented destruction of belt joint through abrasion by the clinker.

In six months of operation, this conveyor has carried 61,000 tons of clinker, and the Standard Portland Cement Company credits the saving of $300.00 in belt cost alone to this conveyor.

The belt used was made particularly to withstand temperatures up to 200°, and is adapted for work on conveying jobs in mines, coking plants and cement factories where heat resistance and ability to withstand hard wear are prime requisites.

Not alone on heavy drives, such as tube mill drives, Griffin mills, crushers and heavy conveyors, are Crescent Belt Fasteners succesfully used, but also on lighter drives of all kinds where dependability is an economic factor, as they assure continuous production.

As many readers of "Cement & Engineering News" may have equally perplexing drives for which the fastening plays an important part for continuous service, the Crescent Belt Fastener Company have just published a new hand book illustrating Crescent Belt Fasteners in use on many different kinds of belting and under different conditions, and giving full data regarding their use. It will be gladly sent to any reader of "Cement & Engineering News" upon request to the Cement and Engineering Service Dept., CRESCENT BELT FASTENER COMPANY, 381 Fourth Ave., New York, N. Y.

A City Built Upon a Hill Cannot Be Hid from the Thousands that will Flock to It.

Ideas as to what should be, are plentiful. In a passing crowd there are enough ideas to run the world. While the brain lives, it produces ideas of some sort or another.

Inventors are daily producing thousands of ideas. It is a liberal education to go over a summary of patents granted. It shows how seriously some ideas are taken and how few are used to practical ends. Like our inland waterways they cover an immense field capable of tremendous usefulness, but are little employed.

For thousands of ideas it seems there is but one successful executor to apply them to useful work. In other words, there are thousands of workers, to one man who can finance them towards one saleable product—thousands of scientists experimenting for only one man to concentrate and apply, like Bell who produced the telephone.

Listen to a piano played by a master, with many wires sounding at one time, but in harmony. A big musical idea is being executed with success. Fistfuls of keys being crashed down with no single purpose would get nowhere.

The man who sifts ideas down to practical purpose and actually executes successfully, sometimes is a hard master, because the most difficult thing in the world is to hold many minds to one bull's-eye. A prosperous community and a great nation are built up by such.

In isolated districts, ideas are apt to scatter and opportunities be frittered away because a native-born executor is not there. The devil usually takes his place and leads astray.

A remedy? Contact with as many people as possible. Bring people by thousands to the district. Go the limit, being assured that, under the workings of natural law, in so many thousands there will come the one executive mind that will see opportunity and do practical things.

A community that is connected with the outside world by steel reinforced concrete highways is like a city built upon a hill and cannot be hid from the thousands that will flock to it.

F. BAACKES,
Vice-Pres. and General Sales Agent American Steel and Wire Co., Chicago.

Mr. W. H. Rucker, Columbus, Miss., is operating a gravel pit near Columbus, and is using a 70-C Bucyrus shovel for the work.

News of the Concrete Products Factories

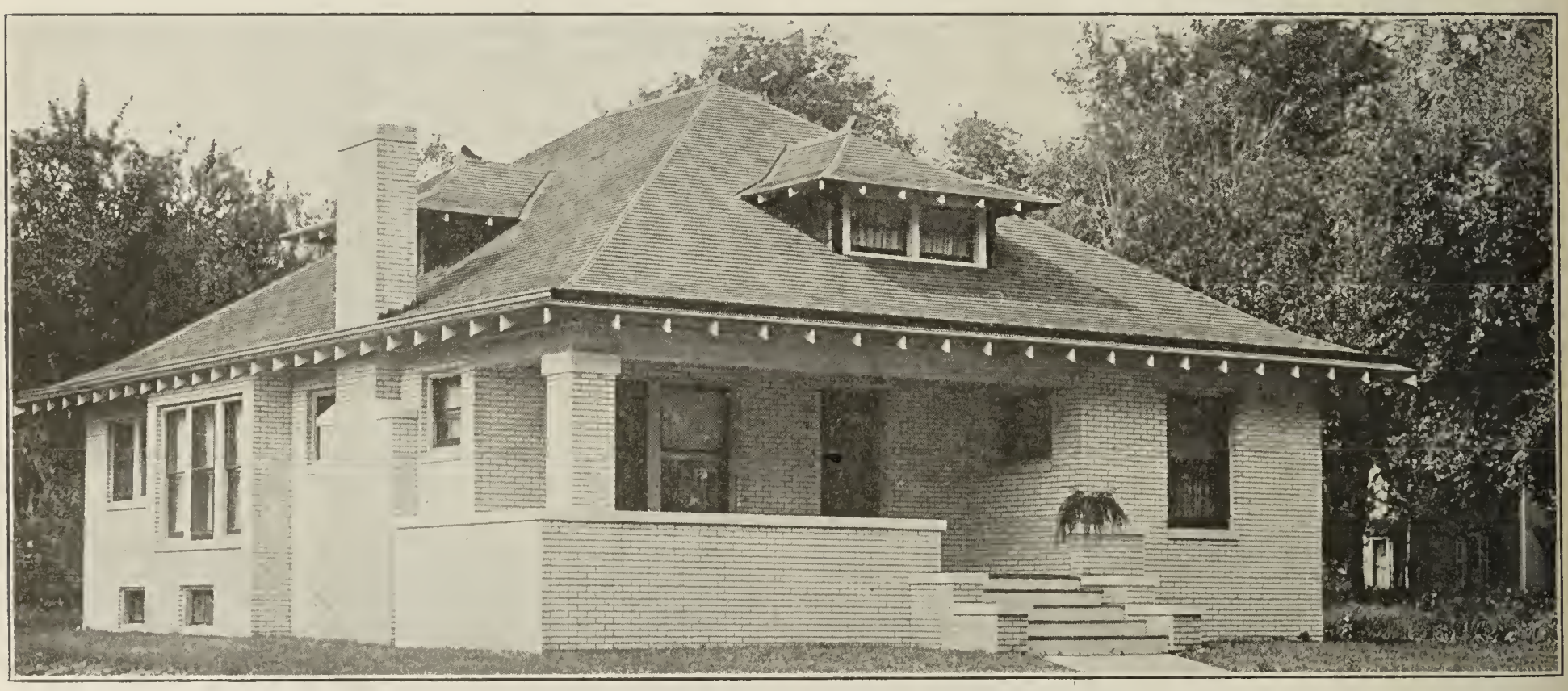
Through the distribution of misinformation and presentation of glowing accounts of quick fortunes in making concrete products, many have been drawn into it who do not have the proper equipment, experience and knowledge for permanent success. Today, with the unprecedented demand for concrete products, there is a tendency in some quarters to rush out the finished products, place them in use and get the money out of them, with little regard to the quality or the permanent satisfaction which will be obtained. With this condition confronting us, the concrete product today is going through another test period to determine whether or not the user in buying a concrete product can depend on durable and lasting quality.

The various concrete products organizations must stand first of all for products of high quality and dependability. The various associations of concrete products manufacturers, including local, state and national associations of block manufacturers, concrete pipe manufacturers, block machinery manufacturers, cement silo stave manufacturers, etc., will be short-lived and miss their objective unless they place quality first. By urging standard practices in manufacture, a thorough knowledge of the quality of materials used, best methods of combining materials for given product, and a thorough curing of the products before they are delivered on the market, more can be accomplished for the future welfare of the concrete products industries than in any other manner.

to avail himself of this information. He should obtain the facts from all the sources possible, read and study them and develop his business according to the recommendations which will produce the highest quality of product. There is perhaps no industry in America with which information and assistance to the users is furnished with so lavish a hand as the concrete industry. The manufacturers of all materials, aggregates, cement, reinforcing steel, etc., have highly organized associations for publicity and extension work, and they are almost unanimous in working to develop an intelligent use of the materials which they furnish.

The present demand for building products furnishes opportunity long desired for popularizing precast concrete building units. For years, with low-priced products of competing materials in abundance, the consuming public, though favorable to concrete, was reluctant to change from well-established customs. With a demand for all building products, the time has come when the products manufacturer can establish himself securely. He can only retain his prestige in future years, providing he maintains high quality during this decisive period. Lack of knowledge is the root of all evil.

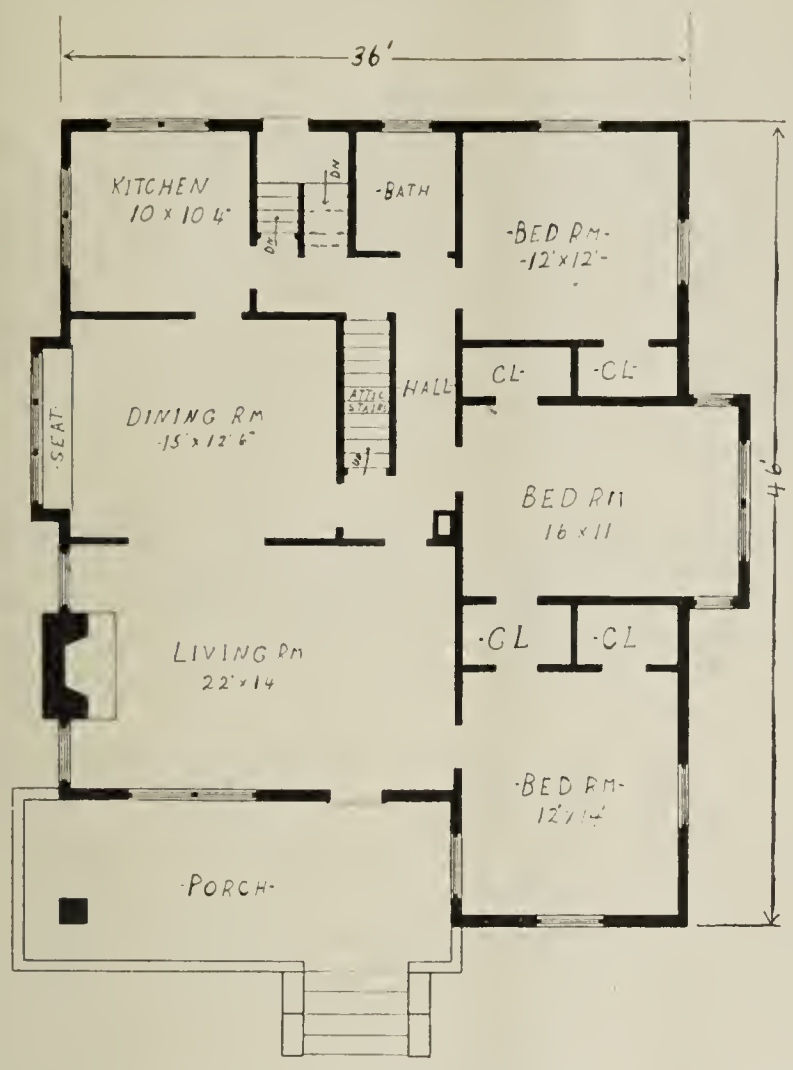
Hugo Schluter, 2002 Hudson street, Los Angeles, Calif. was recently granted a patent on a concrete pole which are commonly used for electric transmission and by telephone and street railroad companies.



Concrete brick residence at Creston, Iowa, designed and built in 1916 at a cost of about $5,000 by Merrill Moore. The brick are poured concrete, faced with white cement and brushed to make rough surface. The inside wall is common poured concrete brick. The plastering was applied directly on the brick wall. There is an air space of one and one-half inches between the outer and inner courses of brick. The house was finished throughout with oak.

Too much emphasis cannot be placed on the importance of thorough curing. Length of time for a concrete product to be cured before it is ready for shipment cannot be stated in general terms. For each class of products, namely, pipe, tile, ornamental concrete, silo staves, concrete blocks or what not, there is accurate knowledge as to the condition the product should be in before it is ready for delivery on the market. It is within the possibilities of every manufacturer

It is a particular object of his invention to provide a construction, readily adapted to be made in concrete, whereby a long article, such as a post or pole, may be originally made and shipped in sections and assembled from those sections to form a strong post of any desired length. Mr. Schluter declared "his concrete pole should abolish the often propped up, ugly, dilapidated, decaying, and therefore dangerous wooden pole in use. Whereas the one piece concrete post is



possible, it is not practical on account of its bulk, the sectional construction is perfect and a decided advantage in various points and ways. Any number of brackets for lights can be attached, thus making the post serve two purposes. By mounting the sections in fluted or other ornamental designs, adding an adjustable base and cornice, a pleasing ornamental column will take the place of an eyesore."

The Robins Peerless Granite Tub Company, H. W. Cork, vice president and manager, Weehawken, N. J. has leased 10,000 feet floor space at 23rd avenue and Sisson street, Baltimore. Will install machinery for the manufacture of concrete trays; annual output 10,000.

V. W. Burge & Son, Wellington, O. have built a number of concrete block silos that have proved thoroughly satisfactory. The one they built at New London, O., for Sam Lave, a breeder of Holsteins, is a model. model.

The Concrete Products corporation, South Bend, Ind., with a capital stock of $6,000, has been formed by the consolidation of the Standard Cement Brick company and the Otto F. Beyer company. Officers of the new company are Otto F. Beyer, president; Edward J. Becker, vice-president; George C. Eckert, secretary, and John B. Bohn, treasurer.

The company is already operating and making cement blocks, bricks and allied accessories. Two plants will be operated, one at Marietta and Dayton streets and the other at Ernsberger street and Ewing avenue. The two plants will have a capacity of 1,000 cement blocks in a day and 5,000 cement bricks. The product will be power tamped and steam cured.

Dyker Construction Co., 211 Bay Tenth St., Brooklyn, N. Y., manufacture concrete blocks in Ideal molds and will increase the capacity of its plant by installing another block machine, concrete mixer and crusher. Also interested in waterproofing compounds.

The Nelson Concrete Culvert company has had its plant in operation on Jefferson street, Marion, Ohio the past two weeks and is producing material every day. At the present time the company is employing about ten men, and with the increase of orders received daily it is expected that the force will be enlarged in the near future to the extent of three hundred percent. The main office of the company is Pontiac, Ill.

Hydraulic Ramming Concrete Stone Machinery, Paterson, N. J., manufactures machines for making hydraulicly rammed building units of exceptional strength and beauty. So dense are these units that they may properly be called reconstructed stone. The stone is inexpensive to make for any special design or shape, light and easy to lay, has 8-in. wall bearings and constructs a wall in which troublesome dampness is entirely done away with. By the use of various facing materials most pleasing surface textures may be secured. Facings made of white and gray granite mixed with white cement and sprinkled with carborundum, sprayed immediately as they come from the machine, develop a faced stone sparkling as if just cut from the quarry. Marble, brown stone, Indiana limestone, Vermont green and other facing aggregates, when revealed by the spraying process reproduct the natural stone with such fidelity that none but experts can detect a difference.

C. L. Ball, Auburn, Neb., has purchased the cement and concrete business of Warner Bros., also of Auburn and will continue the business. He will make a specialty of the Common Sense silos, supply tanks and stock tanks. He will no doubt enjoy a splendid patronage, as concrete is rapidly becoming the most desired material for silo construction. The popularity of concrete for other farm structures is rapidly growing and an energetic business man may enter the concrete field assured of success.

M. J. Griffiths, Barberton, O., is the inventor and manufacturer of the Improved septic tank or privy. Septic tanks are a necessity in any community not possessing a modern sanitary sewer system. The Improved septic tank is of concrete, one-piece construction. It is waterproof and guaranteed not to leak. Two compartments are provided. Upon entering the first compartment, the liquid portion of the waste material passes almost directly over into the second compartment, while the solid portion is retained until the septic bacteria have purified and disintegrated it. After the waste leaves the second compartment it passes into the disinfecting and filtering pocket and then to the outlet. The interior of all tanks are carefully treated with a cement filler. These septic tanks are approved by sanitary inspectors and health commissioners. They can be bought and resold by concrete products manufacturers at a profit.

"For twenty years I have been actively engaged in the manufacture of Portland cement and in the manufacture of machinery for using this cement in producing worthy building materials, writes Mr. Herman Besser of the Besser Concrete Machinery Company.

"Back in the old days too many men went into business with a hand operated machine held together with a few machine screws, with a pile of sand and a length of rubber hose and turned out "Cement block."

"Those men set the concrete building unit industry

back fifteen years and by adorning the landscape with so many horrible examples, postponed for a decade and a half the time when the general public could take advantage of the real virtues of a worthy material properly handled.

"The one-horse plant in the back yard, operated by a man who had made a failure of everything else he had attempted, is almost a thing of the past.

"There is no criticism to be made against the small products plant, simply because it is small. Small plants grow into big ones.

"Whether the plant is large or small, the man who is manufacturing concrete block or concrete brick must make a worthy product.

"He must have the nerve to sell it on the basis of its merit—not offer it simply because it is "cheap."

"There are manufacturers of concrete brick getting more money for their products than the market price of clay brick.

"There are manufacturers of concrete block selling houses, stores and theatres in competition with frame and brick construction, because the concrete block construction is better.

"There are manufacturers of concrete stone selling their products for office buildings, churches, theatres and college structures, and getting more money for the artificial stone than it would cost the builder if he were to buy natural stone.

"The manufacture of concrete building units has gotten onto the right kind of basis. Buyers and users of concrete brick, block, tile, etc., are now making it a point to investigate the facilities and equipment of the plant where the product is manufactured.

"The public knows that such a plant has a reputation to build up and sustain, and thus can afford to put out only those products that are absolutely right.

"And the way to make money in the concrete business is to produce just a few different kinds of things —don't try to make too wide a range of products. Do like Henry Ford does—"stick to one model."

"Confine your products to a few items and then standardize your equipment to make these products in big quantities.

"Use automatic machinery—cut out the man-power whenever you can. Do you realize that saving only one man will pay the interest on $25,000 for a year?"

The Laurel Brick & Sand Co., Middletown, Conn. reports business extra good and prospects very bright for their concrete brick. They operate two Model 5 Helm power brick presses which are giving entire satisfaction.

The Yonkers Concrete Brick Co,. Yonkers, N. Y. operate a Model 5 Helm hand power machine and are making a very satisfactory line of brick.

The Helm machines make the brick under 80,000 pounds pressure, producing a good strong dense brick that is fit to compete with the re-pressed clay faced brick. Corners and edges of Helm pressed brick are clean and sharp and strong and every brick is made of absolutely the same size so the masons can lay them up in the best walls without gauging them. This saves them time so that they can lay concrete brick faster than they can lay clay brick.

The Eau Claire Sand & Gravel Co., Eau Claire, Wis., recently started to manufacture concrete brick, which will take care of a considerable portion of the surplus sand which would otherwise be disposal material. They operate a Wert "Perfect" brick machine. They get $15.00 per thousand for large contracts and $17.50 for small orders. Are interested in materials for facing their brick.

The Noggle Concrete & Tile Co., Dickinson, N. Dak. recently built an addition to their plant. They are exceptionally busy these days, having in operation two Ideal block machines and tampers, Northwestern sewer pipe molds, and two Boss mixers. They get 35 cents f. o. b. shop for their blocks. Would like samples and catalogs on white sand, crushed marble, etc. for facing their blocks.

The Bennett Gravel Company, Spring Lake, N. J. writes: Could you send us the names of some manufacturers engaged in making cement brick? We are interested particularly in the larger operators, who make brick in sizable quantities and who are making successful brick.

The "Hercules" machine manufactured by the Century Cement Machine Company produces concrete building blocks and also trimming stone with any mineral facing desired. A concrete block house is not complete as to durability and appearance, unless the trimming is made of concrete. Artificial stone also makes ideal trimming for brick and stucco buildings. Stucco should be used on concrete blocks on account of color, low absorption and equal expansion. The Century Co. also manufacture a cement bag cleaner and if you use any quantity of cement you cannot afford to be without a bag cleaning machine.

No concrete silo is complete unless equipped with a chute of the same material. It gives a finished appearance to the structure and furnishes protection to the doors in case of fire. Manufacturers of forms for monolithic silos have recognized these facts and provided forms with chute attachments. Several cement stave silo companies also make a practice of building stave chutes.

In one, part of the chute is supported by a single column of staves on each side of the doorway. These extend to the foundation and are clamped to the hoops. The remainder of the chute is held in place by short lengths of rods hooked around the silo hoops. A temporary support is placed under the lower end of the chute during construction and removed after the job is finished.

On some jobs the same method of construction is used except that no support is provided other than the temporary one, the chute being merely clamped tightly to the silo. Seven staves 10 inches wide make a small chute, but eight 10-inch or seven 12-inch staves give better results.

A chute of this kind is easily and quickly built and can be sold profitably at a reasonable price. For improved appearance and complete fire protection, a cement stave chute should be considered a necessary part of every cement stave silo.

The Portland Cement Products Co., Utica, Ill. have for sale or lease a complete concrete products plant, consisting of two "Ideal" block machines, 800 staple post molds, mixer and conveyor, motor driven. Switch track to building. Ten acres of abandoned cement tunnels with an even temperature of 55 degrees Fah. the year around, for curing and storing. The plant is located on a one-acre plat in the wealthiest farming community in the state. Write them for further particulars.

Cement and Engineering News

Vol. 32. Chicago, October, 1920 No. 10

Water-Power Unused Is Wealth Wasted

The unharnessed rivers which now run idly to the sea have a potentiality of millions of hydro-electric power, the utilization of which would lessen the demand on our coal mines, reduce the cost of power to thousands of industries and eventually help to operate our railroads, and thus save much of the coal that now goes to waste on locomotives. The value of the recently enacted Federal water power bill to the whole country cannot be estimated. It provides the machinery for which this country has been waiting with growing impatience for 15 years or more. It is a long step in the right direction. The commission appointed for the purpose of adopting regulations to govern water-power licenses is now sitting in Washington. It is the understanding that hearings will be pushed as rapidly as possible in order that there may be no delay in taking advantage of the provisions of the bill. And then as soon as the necessary regulations are adopted to make the new legislation effective it will be up to the individual States and districts to make full use of it. Every State has water-power available and in some of them the wealth is vast. In no State in the Union is there anything like the development of water-power which there could be and which there may be under the provisions of the recently enacted water-power act.

"Safe, Speedy Service with Every Shipment Insured"

The above caption is the slogan printed on the freight tariff sheets of the Rural Motor Truck Terminals, Inc., which with seventeen associated companies operates out of Minneapolis and St. Paul, Minn. Freight service by motor truck at present extends to more than 100 cities and towns by nine definitely established highway routes. The longest route is from St. Paul to Duluth, a distance of 161 miles. The other routes vary from 17 to 65 miles in length.

The tariff sheets conform in appearance to railway freight tariffs. Stations, routes and mileages are scheduled with rates for three classifications of freight. The cover page of the tariff sheet carries the statement, "Not more than one supplement to this Tariff will be in effect at one time," which will be welcome news to any shipper who has tried to unravel the thread of fact from the tangle of railway freight tariffs.

A page of introductory information describes the service offered and carries two extremely significant paragraphs:

"The rates charged by this company are extremely reasonable as compared with other transportation rates, considering the superior service. While the motor truck is not new to the farmer, our service fills the long-felt need in transporting livestock and produce from farm to market. The merchant can keep his stock fresh and up to date and get delivery the same day goods are ordered. Our service enables anyone within a reasonable distance to enjoy the benefits of motor truck hauling at a very reasonable cost and much valuable time.

"Operating conditions will, of course, depend entirely on road conditions. No doubt there will be times when we cannot operate. These times will be few. When paved roads are a reality, this obstacle will be removed."

Reference is made to this particular enterprise because it is typical of many already serving this and other parts of the country. At present California is the only state where such service is under control of a state department having power to regulate common carriers. In that state the Railway Commission reports over 700 motor freight and passenger routes in regular operation. These routes have been authorized to operate by the State Railway Commission because it has been shown by sworn testimony in every case that a public need for such service exists and is not supplied by other transportation systems. Therefore it is clear that these motor lines do not compete with the railways, but supplement their service.

This form of transportation is growing in extent because it renders a definite service to commerce. Production in our country means little without adequate distribution. Motor truck transportation differs from rail essentially in that the operating companies do not build or maintain the rights of way. The railways are able to offer continuous service essential to the distribution of products only by reason of continuous maintenance and renewal of the way and the rolling stock. The present railway troubles illustrate what happens when upkeep is neglected even slightly. In the case of highway transportation, upkeep of the way devolves upon public officials and carries new and greater responsibilities than ever before. Officials are already awake to the pressing need for substantial concrete highways and bridges. However, construction of highways is not the end of public duty in this respect. Successful administration of a highway system is largely a matter of careful attention to an infinite series of details. A single mudhole, a weak spot in the foundation of a paved road, or an inadequate culvert, may mean the wreck of a costly motor vehicle and serious interruptions to traffic.

An instance of the importance of a seemingly minor detail is reported from a middle western state. On a main highway not completely paved, but in generally fair condition for motor truck travel, connecting two of the most important producing centers of the country, a small culvert was in need of repair. Local road officials tore out the existing culvert and in doing so completely obstructed the highway. Barricades and danger signals were posted beside the culvert, but no

provision was made to inform motor truck operators of the necessary detour around the obstruction. It so happened that it was necessary for a motor truck to retrace its route some eleven miles back from the obstruction before a connecting road could be found detouring the location. It is not recorded how many trucks were thus compelled to add twenty-two miles of unnecessary driving to their journey by reason of the neglect to post a notice at the point of departure from the main highway. It is certain, however, that at least five heavily laden trucks expended their fuel unnecessarily to discover this obstruction. The shippers employing these trucks were paying at the rate of $1 for every loaded mile which the trucks had to travel in the direction of the destination, thus the shippers employing these five trucks had to spend $110 by reason of the neglect to fulfill the very simple duty of placing a temporary notice at the point of detour. The incident probably can be multiplied many times during a single spring month in almost any part of the country. "Ship by truck" can only be a complete success when fairly uninterrupted service may be assured. "Ship by truck" means: first, an adequate surface over which the trucks may find a clear way at any time of the year, and second, vigilant highway officials constantly on the job to handle the details which cannot be attended to by the truck operators.

The Gasoline Situation

What is the gasoline situation? A booklet just issued by the American Petroleum Institute, 15 West Forty-fourth street, New York, N. Y., attempts to answer that question. The table on page 17 shows the constantly diminishing amount of domestic crude oil available for each automobile in use, and the estimates on page 20 of this booklet relates to the future demand.

Never have the production and consumption of petroleum been so great as at present. But the consumption is increasing more rapidly than the production. It may be of interest to you to know that the American Petroleum Institute has addressed a letter to the 5,000 members of the Society of Automotive Engineers, containing the following:

"A careful study of the statistics in the memorandum will show that the amount of crude oil available during the period of very low-priced gasoline was so great as to excuse for the time being any great expenditure of effort on the part of the automotive engineer to conserve fuel. That time is past. The time has come when, from the oil man's aspect, it would seem as though the problem of the automotive engineer is to build engines that instead of going from seven to twelve miles on a gallon of gasoline will go twenty to thirty miles on the same amount, and that the problem is not to build engines to burn refined oil, or some product of petroleum other than the present motor fuels, as at the present time there is not enough petroleum to go around and to meet all requirements.

"With the speed limits of automobiles fixed at about 25 miles an hour, and with the crowded condition of our city streets and roads today, making it unsafe to drive very much faster, why is it not necessary, advisable, and practicable to cut down very materially the consumption of gasoline by all types of automobiles, by the more efficient use of fuel? Should not the horsepower of the heavy cars be cut down, and could not the cheaper and lighter cars be so equipped as to get all the speed desirable from a very much smaller amount of gasoline than is now used?"

The gasoline problem will be solved, but it will take the intelligent co-operation of all persons interested in it to solve it.

Annual Meeting of America Safety for Testing Materials

Of great importance in the history of the society and of the concrete industry is the announcement of Committee C-1 on Cement that a single American standard specification for cement is in sight. This has been the goal of many years of endeavor, but complete achievement has been delayed because of the proposal of the United States Government Departmental Committee to specify, to take effect next January, a fineness with a permissible 20 per cent residue on a 200-mesh screen, as against the Society standard of 22 per cent with a 1 per cent tolerance. In its report this year Committee C-1 announced that after a conference with the government committee it recommended that the 1 per cent tolerance clause be removed from its specification, the intimation being, though it is not directly stated, that the government will withdraw its 20 per cent clause and a universal cement standard will be adopted in which the required fineness on 200-mesh screen is no less than 78 per cent.

Committee C-9 on Concrete and Concrete Aggregates presented three appendices to its report, observations on the effect of organic impurities on concrete, noted elsewhere in this issue, on methods of making compression tests of concrete, and on weight, voids and consistency. The second of the two noted carries nearer the specification stage the adoption of compression tests of concrete. It discusses in some detail such controversial points as quantity of mixing water, consistency or mobility, and proportioning methods. The committee announced that a co-operative series of tests in different laboratories for the study of these controversial matters has been outlined. The committee submitted three tentative tests.

Sand-Lime Brick in 1919

The sand-lime brick produced in the United States in 1919, according to an estimate made by the United States Geological Survey, Department of the Interior, amounted to 145,000,000 brick, valued at $1,725,000, an increase of 47,000,000 brick and of $841,000 over 1918. The maximum output of sand-lime brick—227,344,000 brick—was made in 1916, but the maximum value was that of 1919.

The output of common brick was 142,755,000, valued at $1,688,000, an increase of 45,937,000 brick and of $822,000 compared with 1918. The rest of the output was face brick, which showed an increase of 664,000 brick and of $19,000 compared with 1918. The average price of common brick per thousand in 1919 was $11.82, compared with $8.94 in 1918, $7.54 in 1917, and $6.43 in 1916. The average price of face brick in 1919 per thousand was $16.48, compared with $11.35 in 1918, $9.36 in 1917, and $9.64 in 1916.

Wet Marl Cement Plant at Stroh, Ind.

The Wabash Portland Cement Company Has in Operation, One of the Most Economical and Efficient Plants of this Type

By K. D. Edmonds

Twenty years ago the plant of the Wabash Portland Cement Company at Stroh, Ind., was the farthest west of any plant of its kind in the country. Shipments were regularly made to points throughout the middle west, and the records show that in the old days some of its product was sent as far as the Pacific coast. Now its territory is confined principally to Indiana and nearby counties in Ohio, Michigan and Illinois.

Notwithstanding the fact that the establishment of cement plants throughout the United States has brought about restriction of territory, the plant at Stroh is now much larger and doing a far greater amount of business than in the old days. Cement in the more limited area has called for recent plant increases.

Stroh is in the marl region. The Wabash plant is, therefore, one of those few in southern Michigan and northern Indiana which operate as "wet mills." The plant was completely remodeled during the past few years and includes many interesting features such as a new wash mill, three new kilns and conveying system, new sacking room, arrangement for bulk loading, new clinker and coal storage and a new Compartment Pebble Mill installed for coal grinding, also dust collectors on the coal grinders and the installation of another Raymond mill, etc. It is also electrically driven throughout and modernized in every department. Link-belt silent chain drive is being used on a number of mills.

W. J. Swegman now with the J. C. Buckbee Company, engineers, Chicago, was resident engineer and had charge of all the improvements, having lived at Stroh for several years and also acted as superintendent of the mill.

The plant has a daily capacity of 2,000 barrels and stands beside Big Turkey lake, from the margins of which the marl is dredged. There is enough of marl in sight for fifty years. The lake is a pretty sheet of water, and woods come down to the water's edge. An old-timer who helped build the railroad spur from Melmer to Stroh twenty years ago said that at that time the land was a wilderness.

View of the North End of the Wabash Portland Cement Mill.

General Features

The marl is hauled in by narrow gauge railway, drawn up an incline and dumped into a wash mill on one side of the wash house. Clay, from beds located at Steubenville a dozen miles away, is shipped in over the railroad, unloaded direct to conveyor or outdoor storage, and elevated to a similar wash mill on the other side of the wash house.

From that point the marl and clay travel along together, are washed, mixed, ground and calcined.

Dredging and Hauling the Marl

We rode the little locomotive out along the edge of the lake, across a fill to the other side and down to the farthest dredge, over a mile from the plant. The track is 36-inch gauge and well maintained.

Two 30-ton locomotives are operated, drawing 4-yard V-shaped dump cars. Fifty cars are used.

The dredge is equipped with 1½ dipper. It works along the lower margin of the lake, first stripping off the thin layer of soil, grass and roots, and depositing this on the lake side of the dredge. Underneath is the bluish, greasy marl, full of the shells of untold generations of snails and mollusks. Three buckets to the car is the rule; the bucket turns the trick about every time, and it does not take long to fill up a train.

Wash Plant

The cars loaded with marl are brought to the foot of the 10 degree incline to the wash house. They are hauled up, two at a time by an electric hoist and dumped into a 26-foot wash mill. The marl, originally lumpy, is at once dissolved into liquid form. It is thoroughly disintegrated by four steel-toothed harrows which travel close to the bottom of the mill. These

are drawn by four horizontal arms turning at 12 revolutions per minute. These arms are operated by a 75 horsepower motor through belt driven line shaft and bevel gears.

The tank part of the wash mill is 10 feet deep, of reinforced concrete. The main bearing is supported by a concrete pier in the center. Underneath is a tunnel which provides for periodic clearing of foreign substances.

Clay

A 15-ton locomotive crane, equipped with 1½-yard clam shell bucket unloads the clay from the cars, either onto the storage pile beside the mill, or into the conveyor tunnel mouth. The 24-inch belt conveyor has a total length of 350 feet, part of which is a 19 degree incline into the wash house, and part a 150-foot horizontal section running in the tunnel under the clay storage pile.

Another 26-foot wash mill, a duplicate of the marl wash, handles the clay, which, after it is disintegrated and in liquid form, is stored in a large, double, mechanical agitator to prepare it for mixing with the marl.

The clay is then elevated to a double measuring tank, each section of which has a capacity of 50 cubic feet.

Mixing and Raw Grinding

The necessary clay for corrections is added, the chemist having previously made his analysis. This is done very rapidly. The mixture, in liquid form, is elevated to five large storage tanks which are both mechanically and air agitated.

There are two wet tube mills for fine grinding; one 5 by 22 foot driven by a 75 horsepower motor, the other 6 by 22 foot, driven by a 250 horsepower motor. Normally the larger mill is sufficient for all the grinding.

The feed to these mills is an interesting feature in itself. The wet mix is drawn from feed sumps below the mills. Troughs lead from the sumps to an elevator pit where the material is elevated to a feed box over the mills. The latter are fed by buckets attached to feed wheels, and so arranged that the feed can be increased or decreased accurately by adding or removing buckets.

From the tube mills the ground material, or slurry as it is called, is carried by an inclined trough to an elevator, thence by a 16-inch screw conveyor to nine 14-inch slurry tanks. These tanks are 20 feet high. In the tanks the slurry is kept constantly agitated by compressed air.

As fast as required by the kilns, the slurry is conveyed from the bottoms of the tanks by another 16-inch screw conveyor operating in a concrete trough and discharging into a small, mechanically agitated sump beneath the kilns.

The Kiln and Cooler Equipment

The slurry is burned to clinker in three kilns 8 feet 6 inches in diameter and 185 feet long, using pulverized coal. The clinker is then cooled in rotary coolers 6 by 50 feet, underneath the kilns.

A concrete feed box is located over the kilns and the slurry is elevated from the sump into the box, which contains three 5-foot feed wheels, one for each kiln. These wheels are operated at 12 revolutions per minute.

The kilns themselves are built in two sections, coupled together with a flexible chain coupling, allowing for slight expansion and changes in alignment. A 40-horsepower variable-speed motor drives each kiln. Fuel supply is regulated by No. 2 Reeves speed changers.

Each cooler is air cooled by means of an 8-foot fan, which forces cold air through the cooler. The heated air may be returned to the kilns or discharged to the stacks as desired. The clinker as it comes from the coolers is very cool, and is discharged to a pan conveyor traveling horizontally under the coolers and then, at a 19 degree angle to a measuring tank at the gypsum station. Here the clinker and gypsum are measured and proportioned, not weighed, and then travel by belt conveyor to the preliminary grinding machines, or to storage as desired. Forty thousand barrels is the capacity of the clinker storage, in a 100 by 100-foot room, piled 21 feet high.

Elevating Machinery

Up to this point a number of elevators have been mentioned. They are all similar in construction, only varying in height. Take a typical one for example. The pit is of concrete. In the pit is a steel frame 6 feet wide and 12 feet long, covered with Hy-Rib and plaster. This supports the elevator head shaft and idler shaft. The horizontal travel is 8 feet, allowing the buckets to empty and drip. The take-up is horizontal. The speed of the elevator is very slow. There are two sets of gears and an individual motor drives each elevator. Ley bushed chain is employed, No. 844.

Clinker Grinding

This embodies three ring rolls for preliminary grinding—each mill a unit, one elevator to each mill. The material goes to three screens, the coarses returning to the mills and the fines, through a 16-inch screw conveyor to four finish tube mills. The last are belt driven by 150 horsepower motors. These mills discharge into a 16-inch screw conveyor in the center of the cement warehouse, which has a capacity of 80,000 barrels.

The sacking room is in the end of the warehouse building. Underneath the operators' station at the bagging machines, runs a belt conveyor out to the loading platform.

Coal Handling Plant

The capacity of this plant is 50 tons an hour. Slack coal is used. From bottom dump cars it goes into a track hopper from whence it is fed by a pan conveyor to a gravity discharge elevator. Twenty-four-inch belt conveyors carried it to storage or directly to the mills. This belt is 150 feet long, carried 25 feet above the ground on a steel bridge.

Under the coal pile is a tunnel in which is a 24-inch belt conveyor. This carries it back to the same elevator, and it is raised to a belt discharging into a tower containing a revolving screen to separate the fine dust. The nut size coal is carried on a belt to two 30-ton storage tanks for boiler use. The fine coal is discharged into two 50-ton tanks outside the coal-grinding plant.

Following it through the latter we find it elevated to a bin over the dryer, made from an old kiln. This discharges to an elevator, which in turn discharges into a screw conveyor serving the mill tanks. Two 5-roll Raymond mills do the grinding. A 100 horse-power motor with two pulleys drives mill and fan.

Power Plant

The turbo-generators furnish the power—one 750-kw., 60-cycle, 3-phase, 440-volt. These are served by five vertical boilers, equipped with stokers. Vertical, motor-driven condensers are installed, supplied with lake water by a booster pump.

Seventy-two motors are supplied by this plant, ranging from 3 to 250 horsepower. The following tabulation shows the character of the principal equipment:

Electrical equipment (generating and motor)—Allis-Chalmers Mfg. Company.

Kilns, coolers, one tube mill, etc.—Allis-Chalmers Mfg. Company.

Wash mills—American, Allis Chalmers Mfg. Company.

Coal regulators for kilns—Reeves Pulley Company.

Preliminary grinders (3)—Sturtevant Mill Company.

Finish tube mills (3)—F. L. Schmidth & Company.

Finish tube mills (1)—Allis Chalmers Mfg. Company.

Bagging machines—Bates Bag Valve Company.

Coal grinding mills—Raymond Bros. Impact Pulverizer Company.

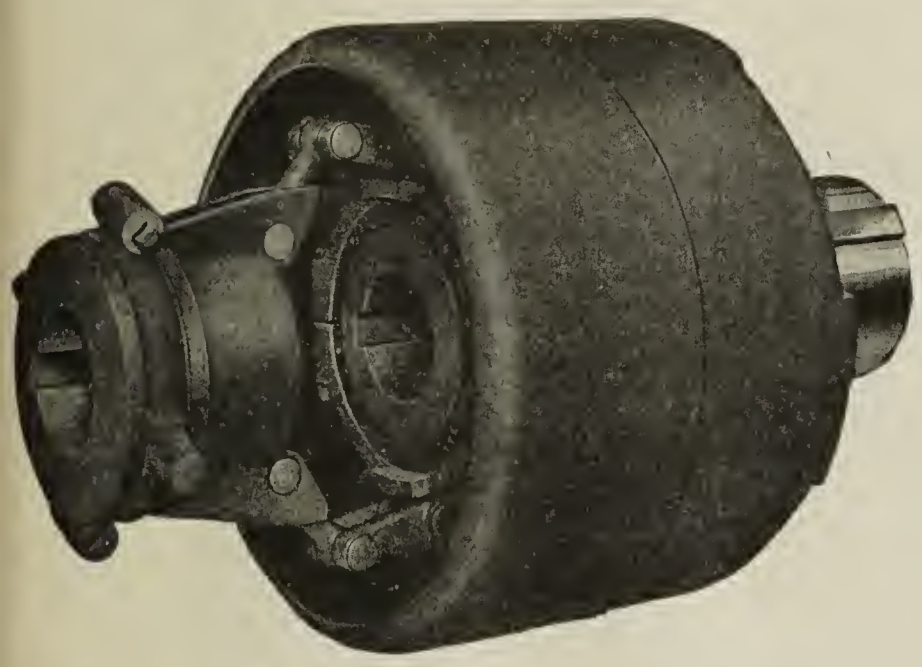
Screens (Newago)—Sturtevant Mill Company.

Tube mill balls—Jeffrey Mfg. Company.

Link-Belt "Twyncone" Friction Clutch

The "Twyncone" Friction Clutch is one of the Link-Belt Company's newest achievements.

Among its many exclusive features, it has one-point adjustment. All moving parts are inclosed, making for absolute safety. It is perfectly balanced, this in itself being a great advantage, as it allows the



clutch to run at very high speed without causing it to "throw in" or out.

Construction of the "Twyncone" clutch is very simple, and the moving parts are reduced to a minimum. High speed does not affect its operation. It can be "eased in" when running at any speed. The friction cones are lined with thermoid. All parts are accessible, and can easily be replaced should the necessity arise.

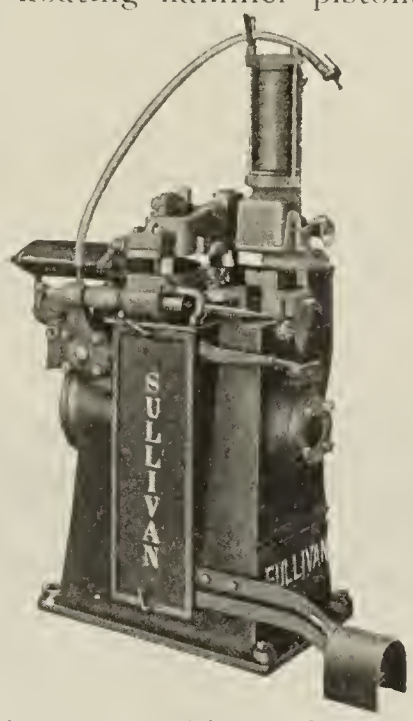
A Hammer Sharpener for Hammer Drill Steel

A new model of the Sullivan drill sharpening machine, embodying the same principles as the older sharpener, but of smaller and lighter construction, has been brought out by the Sullivan Machinery Co., 418 Gas Bldg., Chicago.

This machine is known as the Sullivan Class "B" sharpener and is designed for handling solid or hollow steel of any section up to 1¼ inches in diameter, and to make bits up to a maximum gage of 2½ inches. The Class "B" sharpener weighs 1,500 pounds, as compared with 4,000 pounds for the larger machine; occupies a floor area of 4 by 2¼ feet, and stands 5 feet high.

The essential features of the sharpener consist of a horizontal hammer cylinder and piston, operating a dolly for upsetting, and a vertical cylinder and piston operating dies for swaging the drill bits or shanks. For upsetting, the steel is clamped in steel dies mounted in the lower, or stationary, and upper, or movable jaws of a yoke or vise operated by horizontal air cylinder situated in the base of the machine.

The vice, or clamping cylinder and piston, are of the differential type, the closing or clamping end being 10 inches in diameter, and the releasing end 4 inches in diameter. The action of the vice is controlled by a valve placed in a valve chest on the side of the frame and operated by a hand lever from the front of the machine. A safety stop is provided, which makes it impossible for the upsetting hammer to start until the steel is securely gripped by the vise. The two-hammer cylinders are modified Sullivan "D R-6" drills equipped with floating hammer pistons, and a valve



motion which imparts a blow of great strength and liveliness to the dies and dollies. Air is admitted to the horizontal hammers by the same valve mechanism which controls the vice.

In order to secure the advantages of the floating hammer piston in the vertical member of the sharpener, a novel construction has been employed. When air is admitted to the vertical hammer cylinder, the pressure acts on top of an annular piston fitted in the lower cylinder head, which forces the upper, vertical swaging die down against the steel and holds it in this position in the same manner as the hand blacksmith, or his assistant, holds the flatter or swage in handforging work. The vertical hammer then strikes against the die, drawing out the corners of the steel to proper gage and thickness with a high degree of precision and the same effectiveness as is the case with the older model "A" sharpener.

For cleaning hollow drill steel an automatic blow gun or jet is provided in the front end of the frame, below and to the left of the vertical hammer. At this point a small nozzle will be noted, against which the hollow steel may be thrust thus opening the valve, and permitting air to be blown through the steel. Exhaust air is also used for automatic cleaning jets in an ingenious manner from both the horizontal and vertical hammers, so that the working faces of the dies and dollies are kept clean and free from scale and accumulations of dirt and dust at all times.

The Sullivan "B" sharpener, light model, is operated by compressed air at a recommended pressure of 80 to 100 pounds.

Methods of Operating Flooded Gravel Pits

Difficulties Encountered by the Clem Gravel Co. of Dallas, Tex. in Operating a Wet Gravel Pit by Steam Shovel, With a Description of How They Overcome Difficulties by the Use of Dragline Excavators

A. W. Clem of Dallas has gained for himself among his friends, a reputation of being the best financier in Texas, as it is said that he did $100,000 business in a year on a capital of $2.00. This may sound like a fairy tale. However, be it as it may, here is the story.

The Clem Gravel Co. of Dallas was organized in 1910 to operate a number of sand and gravel pits in the vicinity of Dallas, Tex.

At the present time they have three pits in operation. One at Trinity Mills, Tex., on the Missouri, Kansas & Texas Railway, operated with a Bucyrus Class-9½ steam dragline excavator. One at Clem Spur on the Frisco, near Carrollton, Tex., about 15 miles north of Dallas and within 5 miles of the Trinity Mills pit, where a Class 14 Bucyrus dragline excavator is in operation, and a sand and gravel pit on the M. K. & T. at Ambrose, Tex., near Denison, from which a very fine quality of sand is obtained.

ditions existing. To quote Mr. Clem—"I am sorry for the man who operates a wet pit with anything but a dragline."

The difficulties can best be described by again quoting from Mr. Clem: "I had been operating with the old shovel in the bottom of the pit and pumping water day and night to keep it from floating away. It took all my profits to do the pumping. My track also came down into the pit. It was water-soaked and buried in mud. Engines coming down into the pit to take out loads, would have to make a run to climb the incline, break a rail, tear up the track and play the devil in general."

When the water had been pumped out, ("about 1,000,000 gallons of it," according to Mr. Clem), the shovel averaged about 10 cars daily.

Stripping was at first done by teams. However, with the last three cuts, this was done by the shovel.

The Clem Gravel Co's. Pit

In this pit Mr. Clem first used what is known as a slack line excavator. This proving unsatisfactory, he discontinued this method of operation and until recently has been loading with teams. A 1-yard dragline excavator purchased second-hand, however, has recently been installed.

Trinity Mills Pit

The Trinity Mills pit contains the best grade of concrete gravel in that section of the country. The output is absorbed principally for use in connection with building work and road construction. No screening plant is used, the gravel running so clean that it is shipped as bank run and delivered into cars. The gravel runs about two parts gravel to one part sand.

Difficulties of Steam Shovel Operation

This pit was formerly worked with a small Thew steam shovel. The difficulties encountered with this installation were due, not to any mechanical fault of the shovel itself, as to the impossibility of successful operation of any steam shovel under the ground conIn order to do this, it was necessary to cut out of the pit in order to get the shovel on to the surface. About 50 cars of gravel were generally lost in such an operation. Once up on the surface, the shovel would strip and roll the overburden as far as possible and then move back into the hole and continue loading gravel. This operation was repeated for each of the three cuts. By the time the third cut was made and the third rolling was completed, the overburden had assumed the proportions of a vast mountain.

This method was pursued for about 4 years. Constant pumping was necessary in order to keep the shovel working. Towards the end of 1914, things got worse. A number of over-flows came 30 to 60 days apart, filling the pit to the top. In addition to the expense incurred by the delay in operation, the cost of pumping in order to recover the track and the machine amounted to upwards of $6,000. Naturally Mr. Clem was discouraged and to quote him again, he found himself "busted, $10,000 in debt and with 38 cents in the bank."

Solving the Difficulties With a Dragline Excavator

In January 1915, a Bucyrus Class-9½ dragline excavator was installed. The machine was equipped with a 45-foot boom and a 1½ cubic yard bucket and was mounted on skids and rollers.

Its first job was to back in behind the vast mountain of dirt above mentioned which had been piled up by the steam shovel and to cast it down into the pit from which the gravel had already been mined. When this was accomplished, operations commenced. The machine operated from the surface. The track was taken from the hole and placed on dry ground. The pumping machinery was taken out and the water allowed to rise until it struck a level at 12 to 15 feet. Loading was not hampered. The overburden, as stated above, was cast into the open pit, the dragline taking a swath of about 60 feet. Then without moving, 30 to 40 cars of concrete washed gravel was dug from beneath this overburden and loaded in a one-day working period. The machine has been loading gravel out of from 8 to 15 feet of water ever since. According to the operator he has dug successfully at a depth of 16 feet with water all the way from 8 to 15 feet deep. The stripping however, was usually above the water line, as the water as a rule stops at the dirt line.

The output of the dragline excavator is governed entirely by the number of cars available. In regard to this point Mr. Clem writes as follows:

"We have loaded into cars as high as 1,500 cubic yards in 10 hours and when stripping, 200 yards per hour. This machine has been in constant use for over 5 years. We have been to practically no expense, other than the purchase of a new bucket, hoisting line, sheaves, etc. Only last summer, we were offered twice the amount of the original cost on this machine after 5 years of service.

"Only two months ago a boiler inspector showed up to inspect the boiler. After giving it a thorough test, he asked our operator how much steam he carried and was told from 100 to 110 pounds, although it was supposed to carry 125. 'Young man,' he said, 'it is good for 150 if you want to carry it.' This inspection was five years from the date the machine was put into service and the boiler in almost continuous operation and not one flue had been replaced. The expense of operation had not been equal to the expense of continuous pumping of water under the old method.

Operation of Pit No. 2 Near Carrollton

In November, 1919, a Class-14 Bucyrus dragline excavator with a 60-foot boom and a 2-yard bucket was installed in Pit No. 2 on the Frisco near Carrollton. This machine was purchased to overcome the same conditions as existed in the Trinity Mills Pit. The dragline was ready for operation on November 1st, but the car situation was such that dirt was not moved until January 1st of this year. The car situation has made it impossible for the machine to work anywhere near its capacity, which is 50 to 75 cars daily.

The Product of the Clem Gravel Company

Mr. Clem is now one of the largest operators in the state of Texas. His pits have a loading capacity of from 100 to 150 cars of gravel daily. The concrete gravel produced is recognized by the leading architects and civil engineers as the best in that section of the country. It is of the proper specification for concrete, free from clay, oil, lime or vegetable matter. No screening plants have been put in as yet in any of the pits, as the demand for unscreened gravel is greater than the output. Some of the largest re-inforced concrete buildings in the city of Dallas and throughout Texas have been constructed from the foundation up with gravel from these pits. Among these may be mentioned the Union Station and the Interurban Station at Dallas, the White Rock Reservoir and the Dallas Filter Plant.—The Excavating Engineer.

Class-9½ Bucyrus Dragline Excavator, Clem Gravel Co., Loading Gravel from 12 to 15 feet of water.

"Regarding our two concrete oil storage tanks that were built in 1917, we are very glad to be able to report," writes the Pirtle-Pittman Oil Co., Newkirk, Okla., "that these tanks are proving a great success and have given satisfaction in every detail. One of these tanks holds gasoline and the other ful and we have no cause for complaint on the success of these two products being stored in our concrete storage tanks."

Can You Beat This Record?

"I think I am beating the world when it comes to speed in having concrete block laid," says Austin Crabbs, manager of the Concrete Stone Co., Davenport, Iowa. "Each mason with his helper averages between 400 and 500 8 by 8 by 16 inch block daily. I doubt it you will find this record beaten anywhere. If it is, I would like to hear about it.

When stone masons are not available, training will help brick masons increase their capacity for laying concrete block.

"When our company first went into business," continued Mr. Crabbs, "we noticed that the brick masons working for us were not laying many block in a day. They considered 150 block a big day's work. In the group was a stone mason who with his helper seemed to have no difficulty in laying 300 block a day, or twice as many as the brick masons.

Stone masons in the employ of the Concrete Stone Co., Davenport, Iowa, set a record hard to beat—laying over 400 concrete block each day.

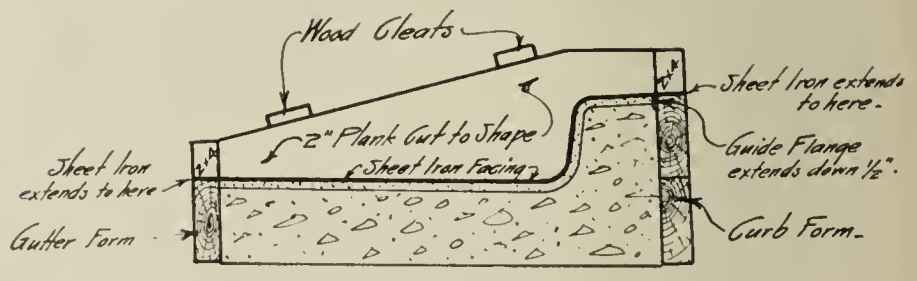
"This man explained to me that he had been accustomed to handling heavy irregular stone and that when given relatively lighter and more regular block he was able to make better time.

"This started me thinking and I made a survey of the stone masons in Davenport. I found only three, but selecting the two best I have kept them with me ever since. These men with their helpers now average between 400 and 500 block each per day. One Saturday, working six hours, they put in a complete footing and laid up a foundation requiring 800 block. Assuming that 75 block replace one thousand brick, these men lay up the equivalent of more than five thousand brick a day.

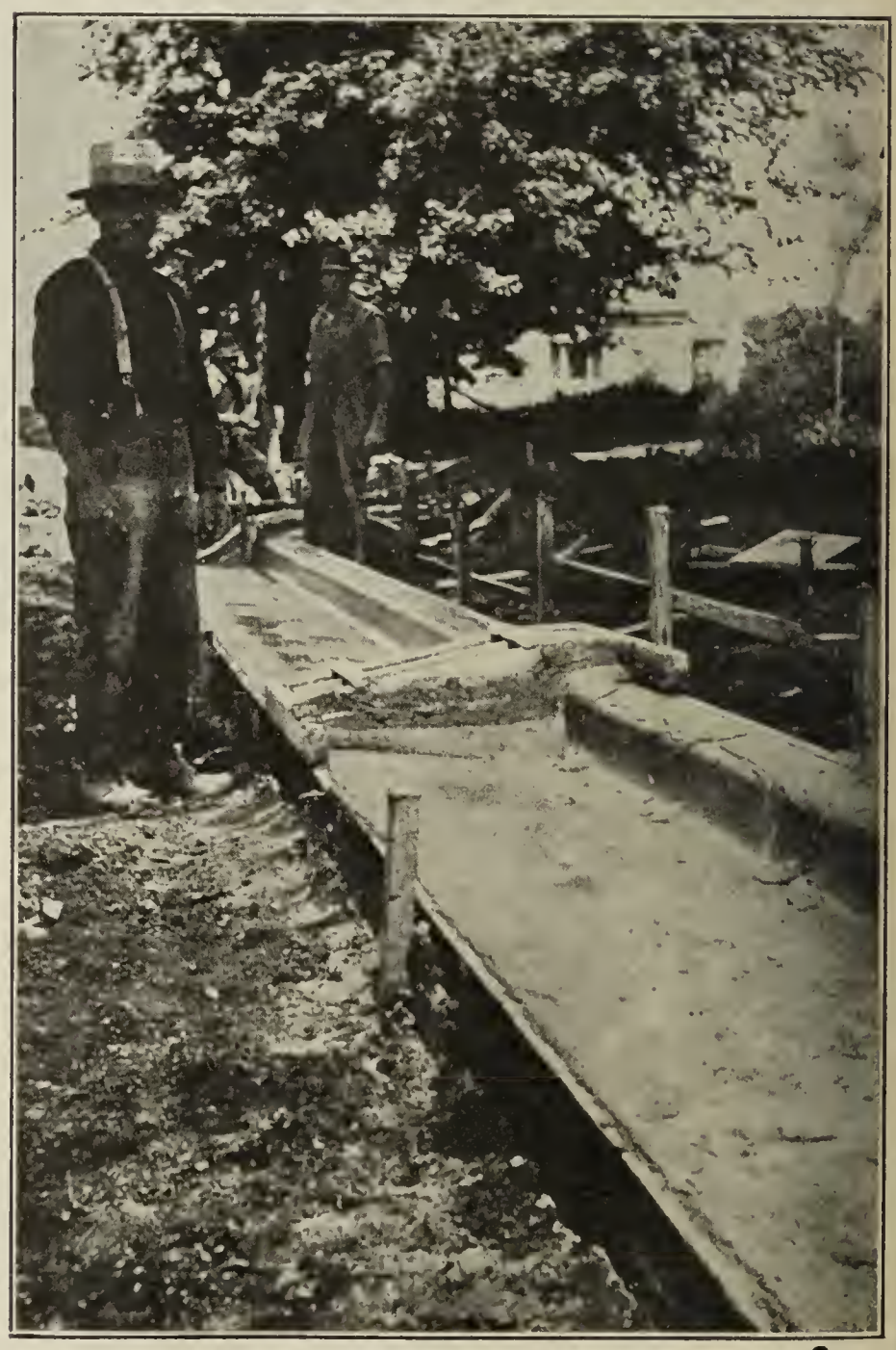
"I believe that my men are above the average, and I intend to keep them so. They have been with our organization for several years now, and we have always managed to find work of some kind for them during the slack times. Other block men can profit by my experience, and either train their men or get stone masons to lay up the block."

It Saves Time and Labor—A Unique Device for Curb and Gutter Work

An interesting device for finishing concrete curb and gutter is being used by Hanlon & Okes, Contractors at Worthington, Minnesota.

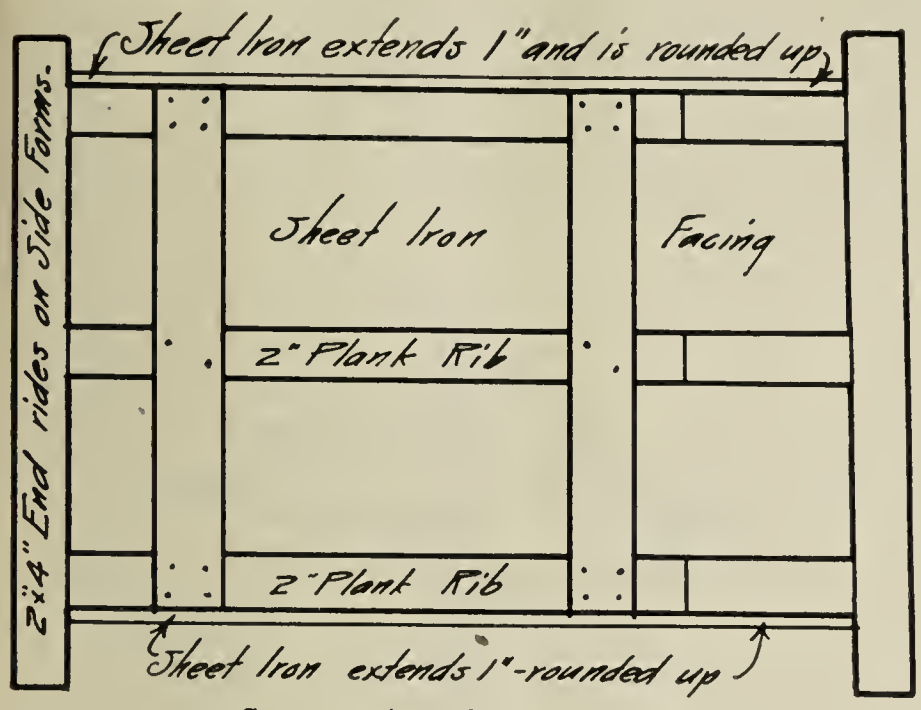


The front and back forms for the combination curb and gutter are set up as usual, the gutter base laid and a portable curb face form clamped in place and the



The Curb and Gutter Finishing Sled Used by Hanlon and Oakes. Worthington, Minn.

concrete for the curbing tamped in. This face form is then removed and mortar spread roughly over the entire surface of the gutter and curb. The finishing sled, riding on the side forms and guided by a ½" metal projection, which is kept snugly against the curb form, is then pushed over the surface, producing a uniform finish that requires no floating and very little troweling.


Sheet Iron extends 1" and is rounded up
Sheet Iron
Facing
2"x4" End rides on Side Forms.
2" Plank Rib
2" Plank Rib
Sheet Iron extends 1"-rounded up

Cross section of finishing sled.

The accompanying photograph shows the operation of this sled very clearly. You can see at a glance that this means a big labor saving over the old method. A cross section of the sled as built by these contractors is also shown. From this photograph and sketch, you can easily build one of these forms if you do this class of work.

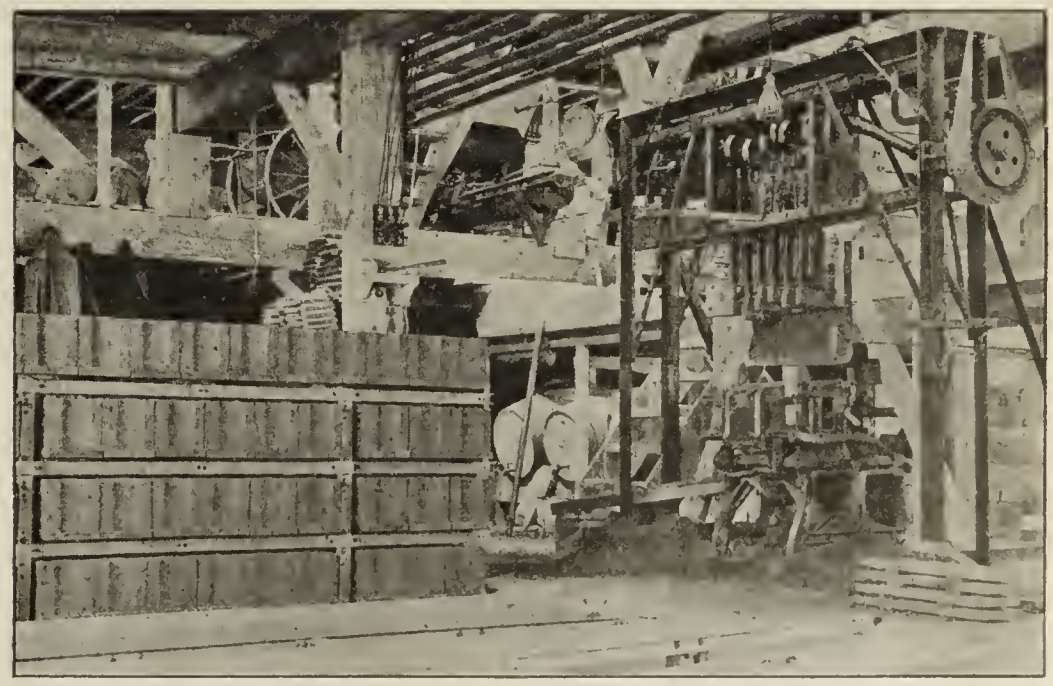
Automatic Mixer Is a Labor Saver for Concrete Products Plants

In the making of concrete for building construction, road work or concrete products, mechanical processes have almost entirely superseded the old hand methods. In order to produce the best concrete in the most economical way the three following conditions must be met: (1) The proper proportioning of the materials for the kind of work desired; the use of too much cement being a waste of valuable material, and a certain minimum proportion being absolutely necessary to obtain the required strength. (2) Perfect mixing of the materials, for it is only by perfect mixing that the minimum proportion of cement can be used and produce the required strength and uniformity in the product. (3) The moulding of the concrete into its final shape immediately after it is mixed. This is important for the reason that the chemical action, or setting, which results in the solidifying of the materials into a solid mass, begins as soon as the cement and water come in contact and proceeds most rapidly in its first stages, and any agitation of the mass while setting breaks apart the crystals already formed thus weakening the product.

The Kent machine illustrated in Fig. 1 is one which has been on the market for over 12 years and has proved itself worthy in different types of service. It is designed to meet all of the conditions above mentioned, is automatic and a great labor saver. The measuring of the several aggregates is under absolute control, may be regulated at will, whether the machine is running or still, and can be relied upon to measure accurately in all weathers and under all conditions. To avoid clogging in the feeding device in the sand and cement hoppers, large and ample openings are provided and, no matter how much damp sand or cement may gather at the lower part of the hopper, measuring continues with the same degree of accuracy.

In Fig. 2 is shown the Kent mixer on a platform, ready to discharge into the tamper machines. The aggregates may be brought to the machine on the loading platform, as shown, or may be delivered from an upper platform into the hoppers, if advisable. On the figure shown the sand is loaded into the hopper from the platform on which the machine stands and the cement is loaded from the floor above. The supply of cement in this way is kept dry, away from any moisture and may be easily handled and dumped into the hopper.

The Kent Automatic Mixer has been on the market years—the measuring of the Aggregates is always under control and may be regulated at will, whether the machine is running or still.



The Kent Mixer on a Platform in a Concrete Products Plant, Ready to Discharge Into the Tamping Machines—Sand is Loaded from a Nearby Hopper, and Cement from the Floor Above so as to Be Kept Dry.

Portable Machinery Co., Passaic, N. J., has just published a 24 page catalog entitled, "Portable Conveyors." This is complete with illustrations showing the various uses of the Scoop Conveyor and other portable conveyors manufactured by them, and describes clearly the labor, time and money saving features of the machines in storing, reclaiming, loading and unloading material such as coal, coke, ashes, sand, gravel, crushed stone, fertilizer, cement, chemical, etc.

Copies of the catalog No. 95 will be sent free upon request to the manufacturers at the address given above.

Transformer and Fuel Oil Stored in Concrete Tanks

During nearly two years test, three concrete tanks, at the Trafford City Foundry of the Westinghouse Electric and Manufacturing Company, built in the summer of 1918 have proved satisfactory as fuel oil containers. Recently, one of the tanks was used to store transformer oil, and held the light-flash oil as easily as the heavy fuel oil.

Each of the tanks has a diameter of 37 feet with a capacity of 125,000 gallons. Built of reinforced concrete the tanks have successfully resisted the weather and the little seepage that occurred was easily stopped. Recently the tanks were inspected by a representative

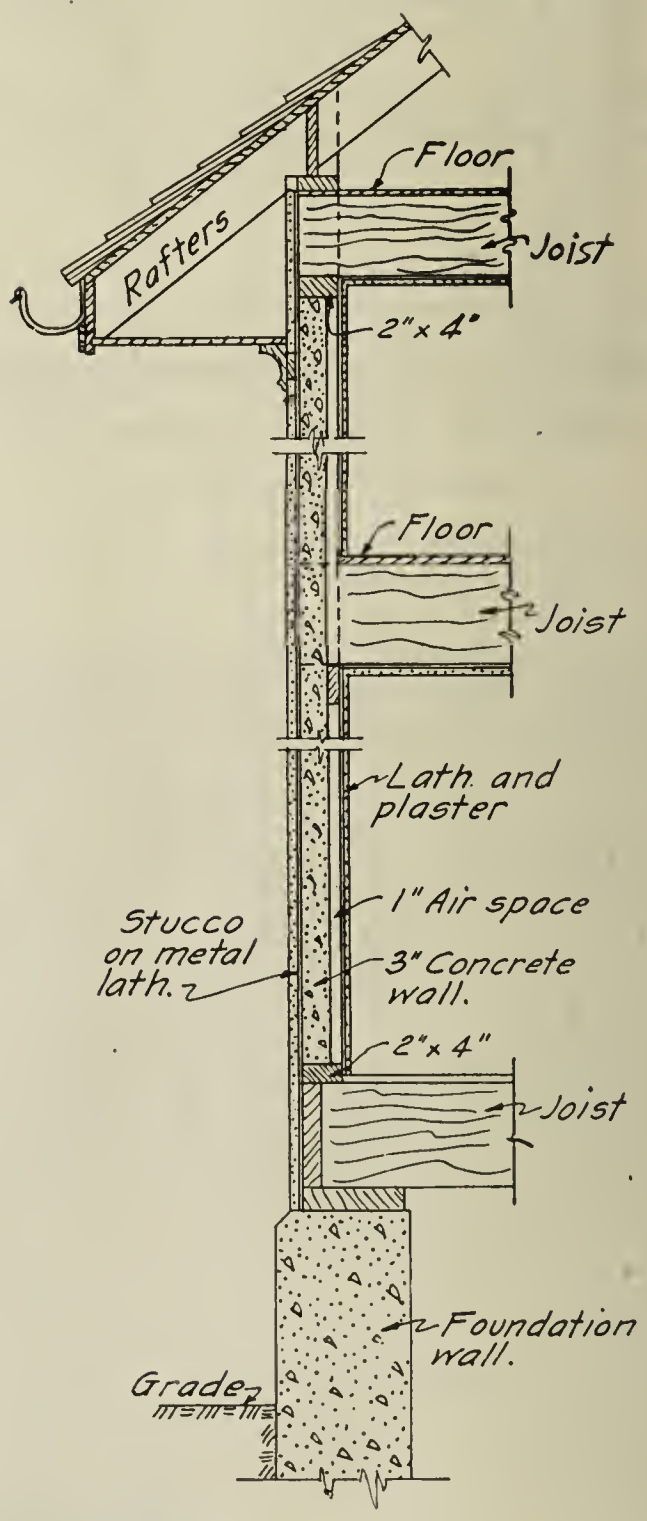
of the United States Bureau of Standards, who is making a study of the use of concrete tank for storing oil.

The tanks have been used to store oil for use in both the Foundry and the Works at East Pittsburgh, Pa., a small pumping station being used to drain oil into cars for shipping. It is thought that as the first tanks have proved so successful other concrete containers will be installed as needed.

Strome System of Concrete House Construction

The Strome System of concrete house construction, developed by M. S. Strome & Co., 342 Powers Building, Rochester, N. Y., is one which requires a small amount of equipment and may be readily used by men accustomed to ordinary wood-frame construction. It produces a continuous one-inch dead air space in walls, which is very effective insulation against heat and cold.

After the foundation wall has been completed an ordinary wood frame is set up, in which the corner posts are three 2 by 4-inch studs, with intermediate studs 1 by 4-inch, spaced 16 inches apart. Window and door openings are provided for in the usual manner. Metal lath is then stretched around the outside of the frame and nailed to the studs. Wooden panels 2 feet high and wide enough to fit between the studs, made of 1-inch boards, are then placed flush with the inside face of the studs. This leaves a 3-inch space for the concrete; the wooden panel forming one side of the form and the metal lath the other. Thin wood strips are nailed to each side of the studs to engage the concrete. The number of wooden panels used determines the amount of wall area concreted at one time. The concrete is deposited by hand and worked into place carefully to prevent bulging of the metal lath. The consistency is such as to cause the concrete to work through the metal lath and form button-like projections, thus producing an ideal surface for the bonding of the exterior coat of stucco. As soon as the concrete has hardened sufficiently, the wooden panels are moved up and another area of wall is concreted.



STROME SYSTEM OF CONCRETE HOUSE CONSTRUCTION, SHOWING CONTINUOUS DEAD AIR SPACE AND OTHER DETAILS

After walls have been completed exterior stucco and interior lath and plaster are applied, the lath being nailed directly to the 1 by 4-inch studs. The space occupied by the small wooden panels during concreting now becomes a 1-inch air space.

The first house of this type was built in Rochester, N. Y., in 1909. It is in perfect condition today, without a crack in the stucco. The owner says the house is easy to heat in winter, is cool in summer and dry at all times, and has required no maintenance except painting of exposed woodwork.

Milk House with Loading Platform

Details for Concrete Construction of a Useful Adjunct to a Small Dairy Farm

(Illustration and data by Courtesy of Universal Portland Cement Co.)

Where it is convenient to have a platform from which to load or unload milk cans, the design shown here will give satisfaction. This milk house is 10 ft. 8 in. by 8 ft. 8 in. inside dimensions. Should it be desired, the walls may be conveniently built of concrete blocks, as the standard size (8"x8"x16") concrete block will conform nicely to these dimensions. The platform is on the side of the house opposite the cooling tank, and double doors are here provided. The door for ordinary use is at the end of the house, and is reached by four concrete steps. The tank will accommodate fourteen 14-in. milk cans, being 2 ft. 6 in. in width, and 9 ft. in length. If concrete blocks 8 in. thick are used, the inside dimensions of the building as well as those of the tank will be changed somewhat to conform.

The foundation and the walls, with the exception of the loading platform, are built just like those of the ordinary small concrete building. The loading platform should extend out about 16 in. beyond the outside of the wall, and should be about 8 in. thick where it joins the wall, tapering to a thickness of 3 in. at the outer edge. The forms for the platform may be constructed easily of planks, and hardly need detailed explanation. The reinforcing for the platform should consist of twelve ⅜-in. rods placing 6 in. apart, center to center, at right angles, with the direction of the wall, and three ⅜-in. rods parallel to the wall, placed as shown in the section diagram, one of the rods being placed close to the edge of the platform, and the other two in the wall as shown. The rods for the reinforcing at right angles with the wall should be 30 in. in length, so that they may be embedded in the wall about 10 in. below the level of the platform. They should be brought up around the inside horizontal wall reinforcing rod, and then bent down to a horizontal position so as to extend to the edge of the platform. The horizontal portion of these rods should be placed an inch below the surface of the platform. If placed at a greater depth, the efficiency of the reinforcing will be decreased.

As a precaution against possible settling, the tank should rest on a concrete foundation. For this purpose, lean concrete (1:3:6) will suffice. This foundation should be high enough to bring the tank to the desired level, as indicated by the dimensions in the drawing.

The tank and floor should be constructed separately, after the walls are completed. Care should be taken before the laying of the floor is attempted, to have the cinder or gravel fill beneath it well compacted; and a small amount of water may be used, if necessary, to aid this operation.

The accompanying table indicates the quantities of the various concreting material needed:

The Cement Products Constr. Co., Walworth, Wis., built 38 milk houses of concrete blocks this year.

Materials for Milk House

	CONCRETE Cu.Yds.	Mixture	CEMENT Bbls.	Sacks	SAND Cu.yds	Cu.ft	GRAVEL Cu.yds	Cu.ft
Foundation	2.04	1:2½:5	2.62	10.48	0.92	24.80	1.86	50.00
Floor and Platform { Surface	0.17	1:2	0.51	2.04	0.15	4.10	.....	.....
Floor and Platform { Base	0.82	1:2½:5	1.09	4.36	0.37	10.00	0.75	20.20
Walls	5.45	1:2:4	8.55	34.20	2.40	64.80	4.80	129.60
Tank	0.97	1:2:3	1.65	6.60	0.50	13.60	0.75	20.20
Steps	0.30	1:2½:5	0.39	1.56	0.14	3.64	0.27	7.40
Roof	3.00	1:2:4	4.55	18.20	1.36	36.70	2.68	72. 0
Total	12.75 Cu.Yds.		19.36 Bbls.		5.84 Cu.Yds.		11.11 Cu.Yds.	

Approximate amount of reinforcing required:
400 pounds of ⅜-inch round rod.
(Order about 10 per cent extra to allow for waste in cutting.)

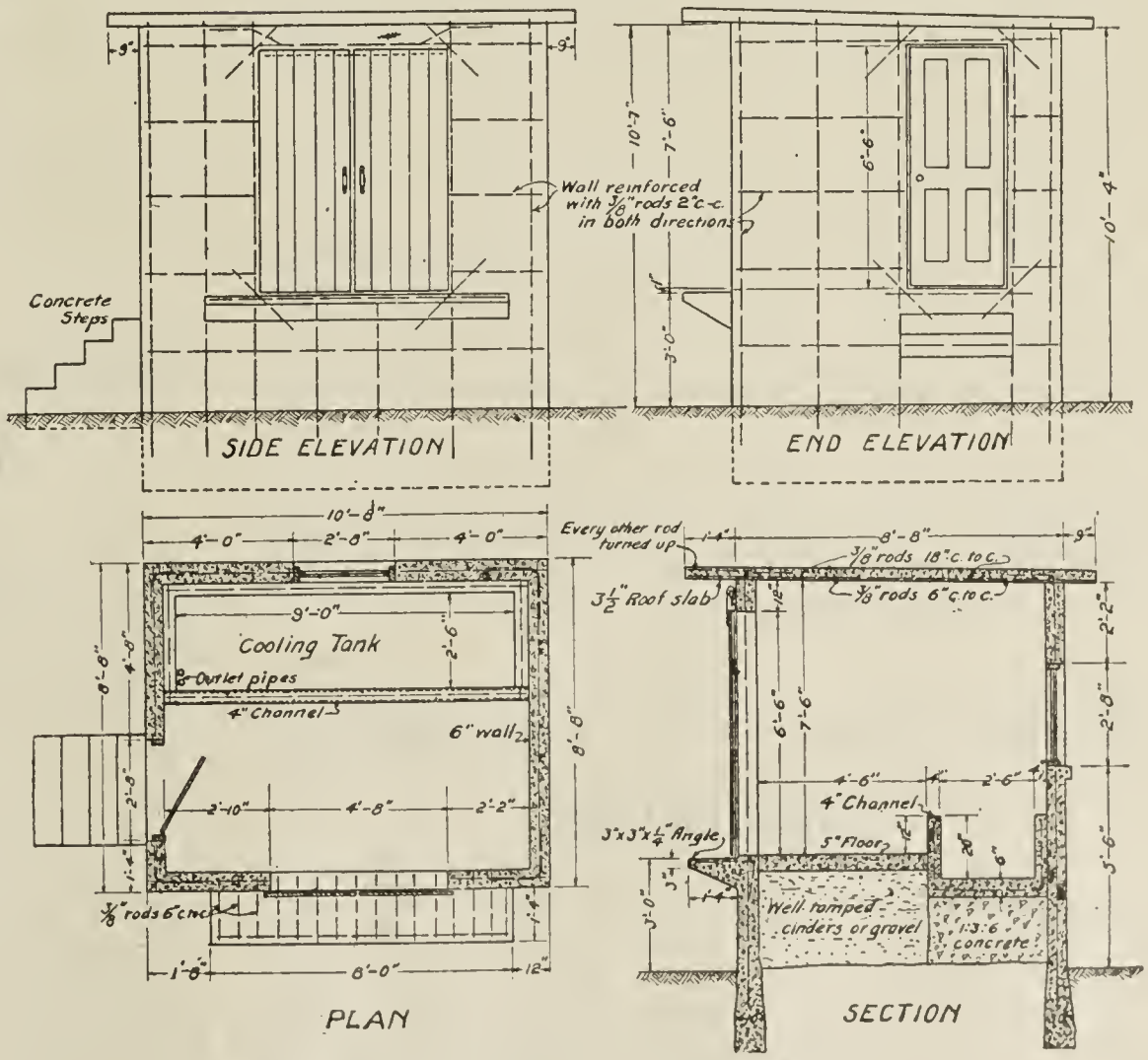
The Question Box

1: What Quantities are Needed for a Curb Wall on Which to Place a Fence?

A good size of curb wall is one 6 inches wide by 30 inches high. Of this height, it is well to have 18 inches below street grade with 12 inches extending above. For each running foot of a wall of these dimensions there will be required 0.061 barrel of cement; 0.022 cubic yard sand and 0.044 cubic yard stone or gravel. The wall should be made of concrete, proportioned 1 quart of cement to 1-2 parts and to 5 parts gravel or stone. After completion the wall can be plastered to a smooth finish in the usual manner, or can be scrubbed with wire brushes to expose the aggregates. With the latter method of finish there is less likely to be hair cracks or checking to detract from the appearance of the finished wall. If it is desired to fasten a fence on the wall, bolts can be embedded, heads down, in the fresh concrete.

2: Filling Iron Pipes with Concrete.

The question is sometimes asked as to whether concrete will harden perfectly inside of pipes. Concrete does not depend on the presence of air for attaining its strength, and, therefore, will set up satisfactorily in any closed container, such as pipes, forms, etc. It is often the practice to fill hollow iron posts and poles with concrete to add to their rigidity and strength. This filling can be done after the post or pole is in place, and thus the handling of the heavy weight of concrete avoided when the pole is raised into place.



Details of Reinforced Concrete Milk House with Loading Platform.

3: Is it Necessary to Provide Small Watering Tanks With Foundations?

All concrete tanks, even in the smaller sizes, should be constructed with foundation footings, carried down about 18 inches. These foundations are not so much to carry the weight of the tank as to prevent heaving and cracking of the tank by action of frost. It is also desirable to place reinforcing in the floor of the tank to prevent any possible cracking. Small tanks for farm use are generally built with a slope on the inside; that is, the tank walls are thicker at the bottom than at the top. This slope allows the ice on top of the water to rise as it expands and prevents it exerting a bursting pressure on the walls. It should be remembered when building a watering tank to make provision for the inlet and outlet pipes.

4: Precautions for Placing Concrete in Freezing Weather.

For most work the use of concrete in the winter months offers no very great difficulty. Especial care must be taken where the bulk of the concrete is comparatively small with a large surface exposed, such as thin walls, floors, etc. The sand, stone, and water should be heated thoroughly before mixing, and this heat should be retained in the concrete after placing by covering it with canvas or building paper and straw or excelsior. Manure should not be used, as it is likely to cause injury where it comes in contact with the fresh concrete. It is sometimes the custom to use salt in the concrete as a preventative of freezing in the place of heating the materials. This can be done with large mass work, but should not be employed in reinforced concrete, as the salt might attack the steel. In any case, the salt will lower the strength of the concrete. It is considered the best practice to heat the materials, and not use salt. The sand and stone can be heated in the usual manner by piling around and on top of iron pipes in which fires are built or by the use of steam jets. The water is heated by means of a steam coil in the water-barrel or a tank-heater. Salamanders (a small sheet-iron charcoal stove) are utilized in keeping the temperature above freezing in buildings in the course of construction.

5: Is Cement Which Has Hardened Fit for Use?

Cement which has become compacted from pressure in storage is perfectly satisfactory for use. When hardened from this cause, the lumps may be easily broken by a slight blow with a shovel. Cement which has become damp or wet "sets up" and is then useless for concrete. To prevent this state of affairs the cement bags should be stored in a good water-tight house or shed until ready for use. The bags should be piled in regular courses and not thrown down in a hap-hazard fashion. Do not allow the bags to lie on the ground. Even on the work they should be placed on a temporary platform raised off the ground by means of small blocks.

White Concrete Cemetery Memorials

The Sanford Vase Company of Clyde, Ohio, produced some very beautiful and imposing monuments of "Granitoid."

The facing mixture of "Granitoid" monuments consists of 1 part of white marble which is run over a 40-mesh screen and all that passes is rejected; 2 parts of black slag retained on a 40-mesh screen and passing a screen having six holes to the inch, and 3 parts of White Medusa Cement. This facing is backed with ordinary concrete graded from ½ in. down to 1-30 in.

"Granitoid Monuments Produced by The Sanford Vase Co., Clyde, Ohio

Such monuments will not stain, crack nor tarnish and present a very attractive appearance hard to distinguish from actual granite.

Westinghouse Issues Electric Shovel Publication

The Westinghouse Electric & Manufacturing Company is distributing Motor Application Circular No. 7132, entitled "Electrification of Excavating Shovels." which describes and illustrates the various uses to which electric shovels may be put, such as railway work, coal mining, and dragline excavating. The method of electrifying is discussed, together with an outline of the choice of equipment. Advantages of electric shovels are fully considered and results of recent tests are given, which show the cost per cubic yard of material removed by means of those shovels.

Tables are produced which show the approximate energy consumption of electric shovels and dragline excavators.

Conveyor Belt Progress Presages Tremendous Future

Past Decade Has Seen Product Advanced from Questionable Position to that of a Necessity—Who, Therefore, Can Comprehend Exact Possibilities?

By T. A. Bennett, Manager, Conveyor and Elevator Belt Sales, B. F. Goodrich Rubber Co.

If one were asked regarding the status today of the conveyor belt, his best answer might be to point out how indispensable the conveyor belt is in the biggest plants of the most important industries; in fact, point out that these industries could hardly exist without the conveyor belt.

He might ask, "How would the Utah Copper Co. itself be possible without the conveyor belt?" How could low grade ore—2% ore—be economically utilized at all, much less handled in such quantities as 35,000 tons per day. Thirty-five thousand tons (Get that?) in a single plant—without the conveyor belt.

The present-day status of the conveyor belt is one of absolute necessity in the operation of the basic industries of this country. Every coke plant, grain elevator, mining plant and cement plant is not only dependent upon the conveyor belt, but is actually built around it.

Progress Is Modern Miracle

The progress or development of the conveyor belt to date is a miracle fully in keeping with modern industrial advancement. It has revolutionized industries and processes. How could anyone two decades ago, when the conveyor belt was in its infancy, have foreseen plants requiring 25,000, 35,000 and 45,000 ft. of belt in their operation—5 to 8 miles? Who at that time could have conceived the handling of 1500 tons of coal an hour on one conveyor, much less conceive a plant operating four such conveyors to load coal from cars to ships (Curtis Bay coaling station)? At that time a 36-in. belt was the limit; today a 60-in. is just one of the big ones.

The development of the conveyor belt has kept pace with these demands made upon it. In this short time it has emancipated itself from the predominating influence of its parent, the drive belt, until today its construction, quality and methods of production are separate and distinct.

Whereas, in the beginning, a rubber cover was pasted on a drive belt, today the conveyor belt necessitates the combination of special ducks, frictions and cover stocks into a homogeneous whole by means of specialized methods of production. The result has been that the conveyor belt today withstands to really an astounding degree the destructive and abrasive service it is called upon to perform.

This perfection of the modern conveyor belt has not only immensely reduced the cost of handling materials, but has also made possible the handling of materials heretofore considered inadvisable because of their size, character, temperature or other characteristics. For example, covers on conveyor belts today have reached a perfection that would surprise a user of 10 years ago—the resistance to abrasion is three or four times as great, and this cover costs one-half to one-third of the cost of the covers of 10 years ago.

This perfection of the conveyor belt has brought it, we may say, into its own. Ten years ago it was a question whether the conveyor belt would continue to be a satisfactory, economic factor. It had been forced down in quality to such an extent as to make its use questionable. This decade has seen conveyor belts steadily improving in quality and fitness for service. The intelligent buyer of today demands and specifies high-quality belts instead of seeking low-priced articles.

The future of the conveyor belt would seem to be beyond the grasp of present-day measurements. If 10 years ago we could not imagine 60-in. belts, how can we say that another 10 years may not see 96-in. belts? If 10 years ago industries and plants demanded only small tonnages, dwarfed by present-day plants, how can we imagine what future plants may require of the conveyor belt?

May not the perfection of the conveyor belt make possible new ramifications of industries or even new industries? May not the nitrate industry, just now being developed, reach new heights through the conveyor belt? May not the mining industry find it economical to work on material now considered worthless? Will we not be called upon to construct a belt to handle material which at present cannot be handled?

Future Demand Will Be Enormous

From a viewpoint of belting business the future demand for conveyor belts is going to be enormous. If one should attempt to figure out the cumulative quantity of belting required in a few years to furnish replacements for past plants, new plants of today and the future plants of tomorrow, the volume of this demand becomes overwhelming.

In view of its ever-growing importance in the industries, in view of the monetary value invoved in the industrial progress of the country, it behooves the manufacturer and the user to carefully guard the progress of the conveyor belt.

The manufacturer must conscientiously work to give increasing value in the belts he offers, strenuously strive to keep quality up to service demands, and finally to insist on correct and sincere methods of selling.

The user must conscientiously work to perfect the conditions of service to make his demands strictly keep pace with service, and finally to sincerely guard against incorrect methods of purchasing.

Austin Cube Mixer Drum Improvement

Application has been made to U. S. patent office for an improvement on the Austin cube mixer drum. Strong claims are made on speed of mixing, loading and discharge. The new design is called the Cube-Hex and the mixing action is increased by the addition of six extra planes which throw the concrete across that thrown by the six side planes. The claims are that dry mix, specified by many states, is much more quickly mixed than even by the cube shaped mixers used by the U. S. government at Panama Canal Locks.

White Cement Bricks Beautify Garage

The first duty of a garage is to protect, but that does not mean that the building may not at the same time be built in an attractive design. The motor cars stored within may not appreciate the structure's good looks, but the neighborhood will, and the neighbors are usually the ones who patronize the garage and either make it or break it as a business venture.

Appreciating this, Frank H. Johnson, contractor in charge of this garage, first designed it along strictly utilitarian lines. It will house its full quota of cars and allow them to be driven in or out with ease. Then he built it of concrete blocks and brick made of gray cement and waterproofed with 2% Medusa Waterproofing in the face mixture, which Mr. Johnson says "makes them perfectly waterproof." Next, he ornamented it with white cement bricks and stone trim. The white bricks, the distinctive feature of the structure, are made of Medusa White Stainless Cement. They added very little to the cost of that building but add considerably to its attractiveness—and to its market value.

The gray cement blocks and brick, which were faced with mica spar crystals, and the white brick and artificial stone, were all made in Mr. Johnson's factory at Ellsworth.

The dimensions of the garage are 60x113. The cost was about $12,000.

Oltman & Lawson Cement Brick Garage, Elsworth, Wisconsin

Brick Machines of Reliability

The "Crescent" foot lever tamping brick machines have a capacity of from 5,000 to 6,000 bricks a day and the "Crescent" power brick machines tamp individually, 12,000 bricks a day. These machines are advertised elsewhere in this issue and are manufactured by the General Service Corporation, 1255 South Wabash Avenue, Chicago, Ill.

"The great strength embodied in the construction of these machines is so apparent that we think an extensively long explanation unnecessary," writes the General Service Corporation. "All parts are built of heavy steel, securely riveted and bolted, also gusseted, to produce absolute rigidity and strength. In a cement brick machine the slightest elasticity and vibration cannot be tolerated for a moment. Years of experience has taught us the way a machine of this kind should be built to stand the abuse and wear and tear to which such machines are subjected.

"All of the mold parts are built of heavy tempered steel, also polished, and brought to absolutely accurate dimensions by planing. The front plate of the "Crescent" is worked out of a solid piece of steel, so there is practically no wear-out to these important parts.

The Correct Method of Power Tamping

"We have demonstrated conclusively that the sprocket and chain system of direct lifting of tamps is the logical, practical, non-troublesome, and fool-proof method of operation. One set of two sprockets operates two tamps. The lifting lugs are arranged on each side, so that each tamp is lifted successively, and at the right time. This distributes the horsepower required in lifting the tamps, and permits machine to run absolutely smooth. Nothing is left to constantly adjust, and tinker with every so often. We save you this money-consuming annoyance.

"Each tamp on the power machine weighs 28 pounds, and each brick is tamped individually. Note this great feature, producing uniform bricks of maximum density. The blow that each brick gets by the dropping of this 28-pound tamp 18 inches, is nearly 300 pounds.

Simplicity of Operation

"One pulley, one lever! Can you imagine anything more simple. Always under control. One throw of the lever sets tamps in motion. One throw idles the whole mechanism. The tamps cannot drop, absolutely, unless it is the will of the operator.

Correct Method of Foot-Lever Tamping

"Our method of vertical tamping is the only practical and scientifically correct one on the market. Your own judgment, even if you have never made a single cement brick, will tell you this. In every stroke of the tamp the material gets a blow parallel to the bottom of the mold, and the result is a uniformly-tamped brick. Our tamp weighs nearly 100 pounds, perfectly balanced above the compartment. This weight combined with its scientific arrangement of aligning permits the operator to deliver a blow with two strokes superior to that of four to six of any other machine.

Mechanical Combination of Hopper, Stripper, and Finisher

"This is the biggest labor-saving invention that has ever been incorporated in cement brick machines. This wonderful improvement permits the operator to make almost double the time, and, naturally, double the amount of bricks, in comparison to any other method.

The Patent Facing Distributor

"Another "Crescent" invention that constant experimenting and genius has produced. This facing plate permits the operator to make all kinds of faced bricks almost as quickly as the common brick. You don't need to touch the facing material, or distribute it with your fingers. Neither do you waste a bit of your facing material. The off-bearer keeps the distributor filled, and with one pull of the steel slide the trick is done. Think what this time and material-saver means. The lack of this invention in the past has been the cause of keeping many out of the brick business."

ARTISTIC MOTOR TRUCK COLORING PROVES BUSINESS BOOSTER

"While I have never met you before, I have noticed your trucks and teams on the street." This is the introduction between many new faces and the D. J. Kennedy Co., of Pittsburgh, Pa., prominent building supply dealer there.

This company has proven beyond a doubt that by keeping their trucks painted the same bright color all the time, they gain a familiarity with the residents of their town that proves a business booster. The bodies of their trucks are all decorated with white enamel paint, the running gears with a bright red color and stripes, as shown by the accompanying reproduction which gives some idea of the striking qualities of this color scheme.

D. J. Kennedy, president of the company, sends the following word to CEMENT & ENGINEERING NEWS:

"It will pay any firm to give special attention to the color scheme of decorating their equipment, making it stand out prominent as against the general run of vehicles which are daily seen upon the streets. We consider it a good advertisement, and it costs very little."

Two of the Artistic Motor Trucks of the D. J. Kennedy Co., Pittsburgh, Pa. The Body is Trimmed in White Enamel Paint Running Gears in Bright Red and Stripes

Cement Tile Company Prospers

The Camden Cement Tile Company, Camden, Indiana, is a growing concern taking rapid advantage of the increasing demand for concrete in the tile field.

Originally started as a company for the purpose of manufacturing building blocks, porch columns and similar products, cement stave silos, concrete tile was added as a side line.

This end of the business, however, has become the largest, and their tile plant is probably the largest east of the Mississippi River.

The Camden Company makes tile from 4" to 32" in diameter from 3 parts of sharp, clean sand and gravel and one part of cement. The tile are then steam cured in concrete steam kilns for 48 hours at a temperature of about 120°.

The "Oldest and Largest" Drilling Firm

What is not so generally known is that the Sullivan Machinery Co., 418 Gas Bldg., Chicago, is the oldest and largest firm of core boring contractors in existence. Back in the "eighties," the Diamond Prospecting Company of Chicago became the leading core drill contractor in America. It employed Sullivan Diamond Drills. In 1892 it was merged with the firm manufacturing these tools, and its president became the president of the new "Sullivan Machinery Company."

The men that built up this early drilling organization are still in charge of the company's department of contract core drilling. Their experience, and the experience of the large corps of skilled operators and superintendents which they have trained and maintained for the past thirty-six years, embrace a knowledge of geological formations and drilling conditions in all parts of the United States, Canada, Mexico and many countries abroad. Millions of feet of cores have been secured for clients, constituting an accurate, per-

manent and indisputable record of the strata and deposits at the sites investigated.

Sullivan Reliability

The importance of employing a firm of absolute reliability and of the highest possible standing cannot be overestimated. The accuracy of the process, the efficiency of the tools used, the skill of the operators, and the responsibility of the contractor behind the drills and men should be considered most carefully. Engineers, cement manufacturers, crushed stone and lime producers, mine owners and mineral land purchasers everywhere accept core records, if secured by this company, as final authority as to location of rock strata or existence and character of veins and ore bodies, whether these cores were recovered last week, last year or last century. The Sullivan Machinery Company stands back of Sullivan records absolutely.

Core drilling operations on the site of the new limestone property of the Western States Portland Cement Company near Buffalo, Iowa, has recently been completed by the Sullivan Machinery Company and the successful results of the drilling tests has determined the cement company to build a cement plant on the property.

New Model Concrete Chimney

A new departure in monolithic concrete chimney construction has been recently developed by the Polk-Genung-Polk Company, Indianapolis and Fort Branch, Indiana. In agreement with the popular opinion that coniform chimneys possess more pleasing architecture than any other, this new construction adopts that design and further ornaments and strengthens the monolith with a series of vertical and integral ribs (half round in section) extending from bottom to top and terminating against the eve at the base of the ornamental top.

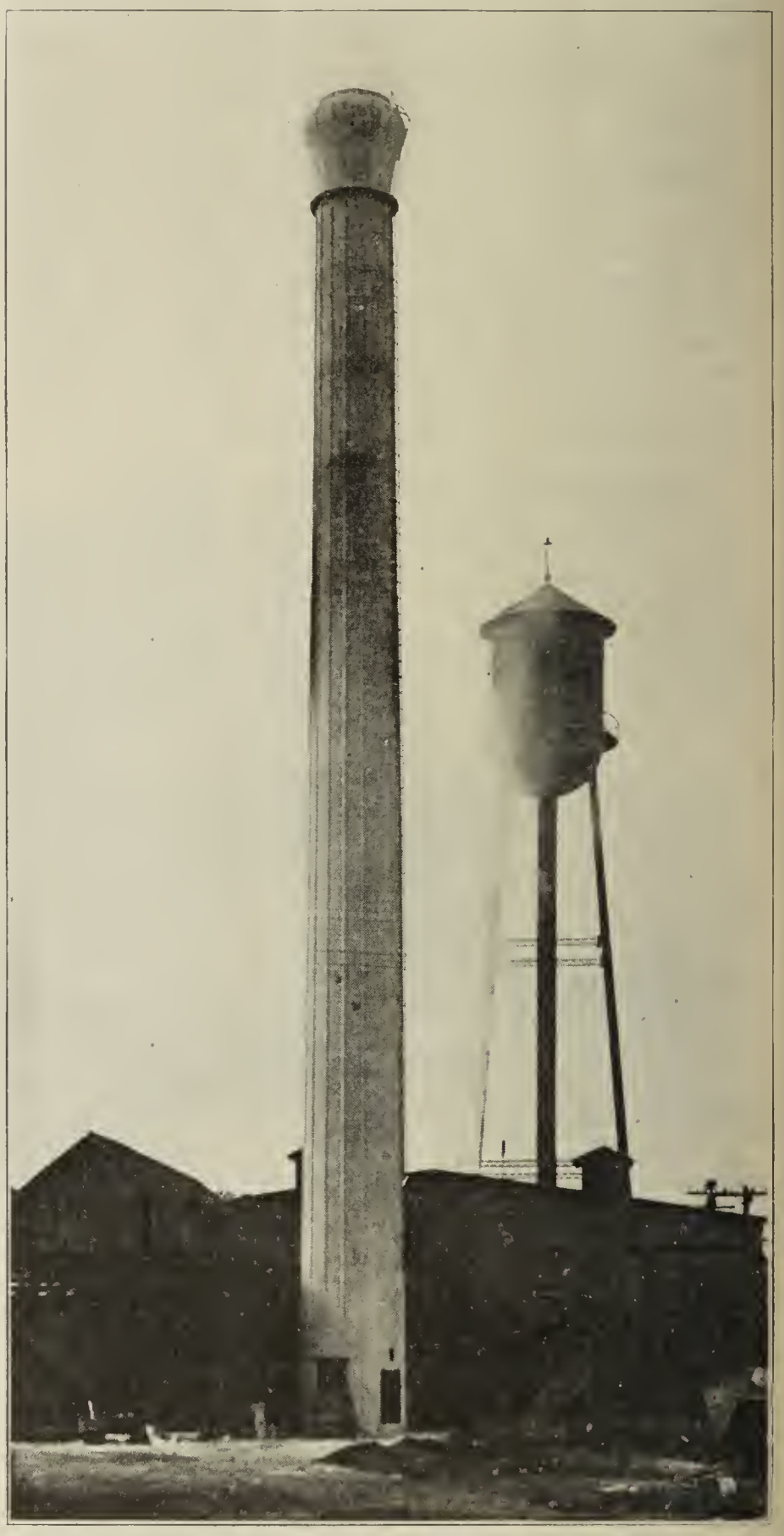
As in this company's concrete grain storage, water tower and silo machines, the underlying principle of the chimney machine is the steel centermast which carries the entire construction equipment. By virtue of this mast, and the set of radiating steel tees, an unusual accuracy in every line of the chimney is made possible, and the uniformity of the taper positively made sure.

The wall forming shells are sheet steel, framed with small angles, in such a manner that they may overlap as the diameter of the stack decreases. In each section of outer forms a rib forming corrugation is stamped. For placing reinforcing these outer forms are readily removed, leaving complete access to the work.

The machine carries its own working platforms, the supports of which are elaborated into a steel inclosing cage over which a canvas envelope is stretched for protection from unfavorable weather. There is no scaffolding either inside or outside the chimney at any time, the workmen using the construction ladder which hangs from the machine.

The rate of progress is six feet per day. Recently four men completed a 5x4x100-foot chimney in twenty-one days.

On account of the rigidity of the machine and a ruggedness of manufacture, the much desired quaky and efficient, though heavy, concrete mix may be used, and thus a minimum of materials required. By numerous other sensible economies the new equipment very greatly reduces the cost of concrete chimneys and at the same time through accuracy of construction and ornamentation, does much to popularize them.



Jeffrey Opens Buffalo Office

In order to render more efficient service and to obtain close co-operation with the customers in western New York, the Jeffrey Manufacturing Co., of Columbus, O., have opened a new branch office in Buffalo, at 1108 Marine Trust Bldg., which will be in charge of Mr. H. W. Scott, formerly of their home office.

Mr. Scott has had long and successful experience in sales and engineering work for this company, which especially fits him to take care of the constantly growing demand for Jeffrey products in his territory and render valuable assistance to clients, in handling of problems covering elevating, conveying, crushing, pulverizing, portable loading machinery, etc.

News of the Cement Mills

C. S. Murray, 314 Perry street, Pontiac, Mich., has 200 acres of marl land from 50 to 100 feet deep at surface, also plenty of clay and peat and wants to get in touch with some syndicate who might be interested in the manufacture of cement. Will incorporate or sell outright inside of 30 days. At present is having tests made by Detroit capital and others.

The tug Dixie recently left Mobile, Ala., and returned from Demopolis, where it went to carry the first load of coal for use in the Demopolis Cement Works. The coal was from Riverview mines, three miles above Cordova. Steamboat men think that a new opening for Warrior coal has been made at Demopolis, for cement is in such demand hundreds of tons of coal will be used there in making cement.

Geoff A. Saeger, formerly with Lehigh Portland Cement Co., Newcastle, Pa., has been appointed chief chemist of the new Bessemer Limestone & Cement plant at Bessemer, Pa.

Representatives of a large cement company have consulted Dr. G. N. Logan, state geologist for the state conservation department, Indianapolis, Ind., according to press reports, concerning a site for a plant in Indiana. The company now operates large factories in Illinois and Michigan.

The location of the plant in Indiana would bring about $500,000 to $1,000,000 of capital to the state, Dr. Logan said. He pointed out that Indiana has many desirable sites for such a plant.

The Lehigh Portland Cement Co., Young Bldg., Allentown, Pa., reported to have purchased 93 acres land as site for big works at Birmingham, Ala., advises they are not ready to make statement regarding possible plans for cement plant at Birmingham.

The Marquette Cement Mfg. Co., Marquette Bldg., Chicago, Ill., reported to build large plant in Birmingham, Ala., advised they are making preliminary survey of South; do not contemplate erecting mill in immediate future; will advise when developments are definite.

The Atlas Portland Cement Co., whose plant is on the Mississippi river at Hannibal, Mo., are beating the car shortage by water. 50,000 barrels were recently shipped by barge to Alton and East St. Louis, Ill., to be used on county and state road work.

George E. Nicholson, Commerce Bldg., Kansas City, Mo., and associates have taken over the plant of the Coosa Cement Company at Ragland, Ala., and resumed operations there under the corporate name of the National Cement Company.

The Ragland plant will have a monthly capacity of 75,000 barrels, or 900,000 barrels per annum. It is but slightly smaller than the plant of the Atlas Portland Cement Co., formerly the Standard Portland Cement Company, at Leeds.

The Ragland plant was taken over some time ago, having been acquired by purchase from the bondholding interests. The latter acquired the property following a receivership.

The National Company was organized by Mr. Nicholson and associates to purchase the plant. Some time was spent in cleaning it up and installing new machinery, including a larger stone crusher and constructing a standard-gauge railway to quarry. Two of the units were placed in operation. The remainder will soon follow, and the plant will be going at capacity.

The demand for cement is far behind the supply, greater, in fact, than the productive capacity. This has encouraged foreign cement manufacturers to make inquiry of the American cement status. C. P. Orr, Gadsen, Ala., British consul, has received inquiries from Britain asking the names of importers of cement.

Rehabilitation of the Ragland cement works, coming on the heels of the location of a large plant at Tarrant City by the Lehigh Company and the prospective coming of the Marquette Company, has added distinctly to Alabama's prestige as a manufacturer of cement.

The plant at Demopolis which was taken over by Mason City, Ia., interests and rehabilitated, is in successful operation, and ships its product both by the Warrior river and by rail. There are now four active cement plants in Alabama, namely the Atlas at Leeds, the National at Ragland, the Gulf States at Demopolis and the Southern at North Birmingham, the last-named being a manufacturer of furnace slag or slow-setting cement.

The new owners of the Ragland plant at one time operated the large cement works of the Dixie Portland Cement Company at Richard City, Tenn., just across the Alabama state line from Bridgeport, Ala. This plant was afterwards sold to a Tennessee concern.

The combined capacity of the four active mills in Alabama is about 3,000,000 barrels per annum.

Carl Leonardt, president, Southwestern Portland Cement Company, Los Angeles, states that the Bucyrus 68-C steam shovel which he has operating at Victorville was giving absolutely no trouble and was doing splendid work.

The Ho Hong Company, James C. Muir, general manager, 333 Paris Panjang, Singapore, Straits Settlements, will increase the output of its mills and will buy considerable new equipment.

Bonner Portland Cement Co., U. S. Hannum superintendent, Bonner Springs, Kan., has recently installed a 36 by 60 Fairmont crusher in its plant.

Dewey Portland Cement Co., Wm. Fowden superintendent, Dewey, Okla., is overhauling its plant for the purpose of increasing the output, and new equipment is being installed, consisting of waste heat boiler, steam turbine, crusher plant and rock storage facilities.

Crescent Portland Cement Co., H. Webster superintendent, Ironton, O., has been engaged all summer in shipping its products via the Ohio river to local points between Wheeling and Charleston, W. Va., and Cincinnati. The company expects to move considerably more for the U. S. government for use in its Ohio river dams during the next few months. Part of these shipments were made on ordinary steamboats, but the bulk of them were loaded on decked barges and taken to destination by towboats owned by the contractors.

Ralph Law, secretary, Signal Mountain Portland Cement Co., 1026 James Bldg., Chattanooga, Tenn.

advises us that it will be possibly 30 or 60 days before work will be started on the buildings of their new plant, which will have a capacity of 5,000 bbls. A. F. Miller, of Jackson, Mich., will be engineer and designer. Geo. P. Dieckmann, of Demopolis, Ala., will be general manager.

J. S. Lockwood has been appointed superintendent of the Wolverine Portland Cement Co.'s plant at Colwater, Mich., succeeding J. J. Parker, resigned.

W. G. Clark, president of the Clark Dust Collecting Company, Chicago, Ill., an authority on dust collecting and ventilation in factories and dry crushing mills, says that in the cement industry there is a great deal of interest being taken in solving dust problems. There was a time when cement mills thought that dust was unavoidable, and that it was part of their business to have a lot of dust floating around, but in late years we notice a marked change in their opinion. Cement dust is valuable. They spend hundreds of thousands of dollars in pulverizing and grinding machinery to pulverize their raw and finished material into a fine powder such as cement is, and they figure it is foolish to let it escape and get away from them in this condition. Therefore, they are putting in dust systems to reclaim this fine dust. It reduced the most of manufacture, and economical manufacturing of all products is looked after more carefully than in former years. They also figure that by eliminating the dust the sanitary condition is so much improved that it pays to have this improvement, as they secure a better day's work from their employes, and save wear and tear on their machinery.

E. L. Davis has resigned as superintendent of the Crescent Portland Cement Co., of Wampum, Pa., where he has been for the last 6 years. Mr. Davis has taken up new duties as superintendent of the United States Potash Co., manufacturer of portland cement and potash. This company's plant is located at Monolith., Cal., Kern county, and was previously operated by the City of Los Angeles. It has now been taken over by F. A. Ballon, Aman Moore and Coy Burnett, of Portland, Ore., and will be in operation about Aug. 20. General offices of the company are located at 609 Hibernian building, Los Angeles.

According to press reports a Chicago firm has taken options on 2,000 acres of land north and east of Gosport, Ind., with a view of purchasing the property for the establishment of a cement plant.

A large blast costing about $25,000 was recently shot at the quarry of the Southwestern Portland Cement Co., El Paso, Texas. The "shot" sliced off a section of the mountain 750 feet long, 70 feet thick and 140 feet high, or 500 tons of rock, which were expected to produce 1,500,000 barrels of cement. The amount of powder and rock moved were so well balanced there was scarcely any report. For safety and efficiency the explosive charges were detonated with Cordeau-Bickford detonating fuse.

Over 17,000 pounds of explosive were used in a large blast recently fired in the quarry of the Superior Portland Cement Co., Concrete, Wash. From 125,000 to 140,000 tons of rock were loosened and the explosion was barely heard in town. Preparations for this blast have been under way for some time. The greater part of the explosive was placed in "coyote holes," bored into the face of the quarry for distances of from forty to fifty-three feet. A number of "well holes" were also drilled, in order to leave a square face on the quarry after the explosion. The plans for the blast all proved successful, and although it entailed a great expenditure, the company figures that the operation will save money in the end, over the old system of blasting down small quantities of rock at a time.

Testing of the earth at the Cook farm near Buffalo, Iowa, to determine the fitness of the rock for manufacturing cement is nearing an end. Drills, as well as hand augurs, have been used by the Sullivan Machinery Co., of Chicago, in the tests. Drilling at some places has been to a depth of 120 feet.

With the last of about 50 holes drilled this week promoters of the Davenport Cement Co. plan to establish a $2,000,000 cement mill on the Cook farm and will await the final report of the Robert W. Hunt Co. of Chicago, with confidence. They are at loss to know how that report on feasibility of establishing a cement mill can be anything but favorable.

The preliminary reports of the company, based on the cores filled with samples of the rock at practically all depths to 120 feet, have indicated almost ideal conditions for manufacture of cement. The holes drilled by hand augurs to determine the presence of clay for use in the cement have been to a depth of about 30 feet. That enough clay can easily be obtained right on the farm is the prediction of those who have followed the experiments.

The Hunt Co., however, is about the final authority in such matters. It may be several weeks before a final report is submitted to the Davenport Cement Co.

R. B. Cook, a member of the corporation of the Davenport Cement Co., is very optimistic over the prospects for a big cement mill on the farm. That it is a question of time only is his belief. The shortage of cement coupled with the unprecedented demand for it not only locally, but in all parts of the country, and the economical manner in which the cement mills can be operated at the Dodge-Cook farm, leads him to be very confident as to the outcome of the drilling that has been in progress the past few months.

Several cement plants are located at some distance from their sources of raw materials, but generally in such instances the limestone or shale is crushed at the quarry. In case of the Hawkeye Portland Cement Co., whose plant is just outside of Des Moines, Ia., the quarry is at a distance of about 50 miles from the plant, but the stone is brought to the cement plant to be crushed.

The rough quarry stone is brought as ordinary freight by the railway company from the quarry to the plant in standard gondola or hopper-bottom cars. As the stone supply could not be made dependent upon obtaining hopper-bottom cars, the dumping device for the cars at the plant end had to be designed to handle any kind of rolling stock.

The problem was solved by the use of a standard car dumper of the type which has been used for a number of years at Great Lake ports for handling iron ore and coal, but this is probably the first use of one of the largest size car dumpers in the rock products industry.

It consists of a tower structure of steel construction. The car is run on to a platform, which is raised like an ordinary elevator a height of about 30 ft. The steel frame carrying the car, which is of course securely locked in place, is swung about a pinion or turning point on the side of the structure nearest the crushing

plant, so that the car is turned over sufficiently to empty it.

Special concrete counter-weights make it possible to dump a loaded car in about 2½ min. with a 250-h. p. electric motor. The addition of the counterweights makes it possible to utilize the same motor which was previously used to operate a car dumper of much smaller capacity.

The dumping of 50 tons of stone into the 42-in. gyratory crusher all at one time requires a feeding hopper of special design. The opening across the top is about 40 ft., the length of a car. The hopper bottom is inclined at an angle of about 45 deg. and is floored with steel railway rails, with the heads up, and laid as closely together as the flanges permit. The sides of the hopper are lined with boiler plate and narrow the hopper or chute down to the width of the crusher opening.

The crusher foundation is sufficiently elevated to allow the crusher to discharge into an elevator pit at about ground level. The stone from this primary breaker is elevated to a small storage bin which feeds the battery of secondary crushers, which are also so mounted that all their working parts are above floor level.

The primary crusher is equipped with a grappling hook for loosening large rocks when the crusher opening becomes choked. This hook is operated by a small electrically-driven hoist controlled from the platform back of the crusher. A chain hoist is also suspended over the crusher opening to further facilitate the handling of the large chunks.

A Model Cement Plant Perfectly Equipped to Produce the Highest Grade of Portland Cement

The Superior Portland Cement Co., C. L. Wagner, superintendent Concrete, Wash., has a thoroughly modern 5-kiln plant, which can be operated either by coal or oil and has a present daily capacity of 3,000 barrels. This, however, will be increased as the necessary facilities can be provided and the company is now opening up a new quarry from which to secure a better supply of raw material. Motor drive is used throughout the mill.

The coarse crushing of lime rock is by two Gates No. 6 gyratory crushers, each of the capacity of 25 tons per hour, reducing from 12-inches to 2-inches minus. Each crusher is operated by a Westinghouse 50 hp., 850-r.p.m. motor, by means of leather-belt transmission. The crusher product passes to storage bins, from which it is carried over a Goodrich 24-inch inclined belt conveyor to bins over the preliminary grinding machines. This belt conveyor is operated by a 10-hp. motor that has a Foote speed reducer.

The preliminary grinding is accomplished by a Bradley Hercules high-speed pulverizer, working wet. It is driven by a 275-hp. vertical motor, connected to the pulverizer by a leather belt. This machine has the capacity to pulverize 125 barrels per hour, reducing from 2-inch to 20-mesh minus. There is also a 7 by 9-foot ball mill using metal balls, driven at 19 r.p.m. by an Allis-Chalmers 150 hp. motor, which is connected to the ball mill by a Link-Belt silent-chain drive, 50 inches in length. The ball mill merely supplements the Bradley pulverizer or takes its place when required.

It is at this stage of preliminary grinding that the clay material is mixed in proper proportion with the crushed limestone—the two elements being mixed and ground together in the Hercules pulverizer, or in ball mill.

The next process is to further reduce the pulverized mixture in tube mills. For such work there are 5 tube mills, each 6 feet diameter, 22 feet long, running 24 r.p.m., and one 7 feet diameter by 22 feet long, at 19 r.p.m. Each tube mill is driven by a 10 to 20-hp. motor, through a Link-Belt silent-chain drive. About 93 per cent of this tube-mill product will pass a 200-mesh screen. In these tube-mill installations the silent chain connects the motor with a jackshaft and the latter is connected by reduction gears to the tube mill.

The fine-mesh mixer from the tube mills is conveyed by bucket elevators to slurry tanks, each equipped with compressed-air agitators. The 8 slurry tanks are each 16 feet diameter and 36 feet high, constructed of concrete. These tanks are all connected, so that slurry may be passed from one to another. The material from the tube mills is all run to one tank and after laboratory tests are made, a correction in the proportions of lime and clay is accomplished in the third tank. The slurry, with approved proportions, goes to the rotary kilns, all the slurry feed passing from one tank. A disc-bucket feeder for each kiln is operated, the speed of bucket being controlled by a rheostat at the control end of the kiln.

There are 5 rotary kilns in the plant—all in operation. Three of these have each a length of 125 feet and a diameter of 7 and 7½ feet, one of 135 feet length and 8 feet diameter, and another 200 feet long, 8 feet diameter. Each kiln is driven by an individual direct-current, variable-speed motor, with belt transmission from the motor to a pulley on the driving shaft, with the standard series of reduction gears between that shaft and the pinion that rotates the kiln.

In this arrangement the motor has a speed range from 850 down to 425 r.p.m. These are Westinghouse and Allis-Chalmers motors. Kiln fuel consists of pulverized coal. The coal, which comes from the Bellingham mines, is unloaded from cars to a track hopper, is moved from there by scraper conveyor to a storage pile, thence reclaimed by screw conveyor through a tunnel, and discharged into a rotary drier, 7 feet diameter and 75 feet long. After discharging from the drier the coal passes by elevator to bins over 3 Raymond mills, each driven at 120 r.p.m. by a belt-connected 85-hp. motor. Each mill pulverizes 5 tons of coal per hour, about 95 per cent of which would pass 100-mesh.

The kiln product, or clinker, is carried by inclined bucket elevators and discharged in piles outside the building. It is carried then by pan conveyor to the cooler, thence to the measuring box, where gypsum, amounting to about 4 per cent by weight of the whole, is added to serve as an agency for retarding the set. After a pulverizing process in a Bradley-Hercules mill, the material is passed to the six finishing tube mills, each 6 by 22 feet. Each tube mill is driven at 24 r.p.m. by an Allis-Chalmers motor of the speed of 585 r.p.m., the tube-mill speed being reduced by Link-Belt silent chains and gears.

The storage capacity of the finished product is 100,000 barrels. This is provided by 13 concrete silos. Four of these are 32 feet diameter and 55 feet high, and 9 are of the same height and 22 feet diameter. The entire stockhouse is served by screw conveyors, operating in three tunnels, whereby the bulk cement is moved to the sacking department.

News of the Gravel and Crushed Stone Plants

The increase in freight rates has not changed the prices of sand, gravel and crushed stone. These materials are usually of local production and, therefore, would ordinarily not be affected by changes in freight.

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd..

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$3.00	$2.00	$3.00	$2.00	$1 50	$1.25
Denver	1.40	1.60	1.80	1.60	*1.00*	1.25
Chicago	2.15	1.35	2.15	1 35	2.15	1.35
Kansas City	3.25	2.50	3.75	3.00	1.25†	1.00
St. Louis	1.50	1.78	1.55	1.82	1.55*	1.68
Seattle, per ton	1.25	1.25	1.25	1.25	1.25	1.25
Dallas	2.50	2.00	2.50	2.00	2.00	1.50
Minneapolis	2.00	1.25	1.35	1.35	1.25	.60
Cincinnati	....	....	1.50	....	1.45	1.35‡
San Francisco	1.50	1.15	1.50	1.15	1.50	1.00
Boston	3.50	1.60‡	3.00	1.65‡	2.75	....
New Orleans	3.05	2.40	....	2.40	1 55	1.20
Los Angeles	1.25	1.02	1.25	1.02	1.15	.70
Atlanta, per ton	2.25	2.00	2.25	.	1.15	1.1(
Detroit	2.50*	1.90	2.50*	1.90	2.50*	1.80
Baltimore	1.40‡	1 54	1.60‡	1.75	.70	65
Montreal, per ton	1.45*	1.20	....	....	*1.30*‡	1.10

* Fine white sand, Pacific and Ottawa, per ton $6.
† Kaw River sand is $1.75 per yd. ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1.90@2 00	$1.65@1.75†	$2.15	$1.75@1.85
Chicago	2.35	1.30	2.50	1.30
St. Louis	1.90	1.50	1.90	1.50
Dallas	3.50.	2.70	3.50	2.70
San Francisco	1.50	1.50	1.50	1.50
Boston	3.00*(del)	3.00	3.00 (del)	3.00
Minneapolis	2.25†	1.15	2.50	1.25
Denver	3.75	....	3.75	1.60
Kansas City	2.35	1.90	2.35	2.00
Seattle (Del.)	3.50	1.50	3.50	1.50
Cincinnati	....	....	1 65	....
Atlanta	3.10*	2.25	....	2.35
Los Angeles	1.60*	1.20	1.70*	1.12
Detroit	2.00*	1.65	2.00*	1.65
Baltimore	1.80*	1.25	2.20*	1.50
Montreal	2.30*	1.90	2.55*	2.15

* Per ton. † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

On application of the Silica Sand Producers' Traffic Association of Illinois the Interstate Commerce Commission, in a recent opinion declared unreasonable rate on Silica sand from the Ottawa district in northern Illinois to points east of the Indiana-Illinois state line.

The Wilson Sand & Supply Co., Huntington, W. Va., are exceptionally busy these days. They operate suction dredge, digging and loading with clam shell buckets and "Whirley." Daily capacity 1,000 yards.

The Diamond Sand & Gravel Co., sales office, 883 The Arcade, Cleveland, O., have a successful modern plant at Bedford, Ohio, daily capacity 1,000 yards. They operate two locomotive cranes and a Sauerman scraper, equipped with a 90 horsepower motor.

The Bethlehem Mines Corporation, South Bethlehem, Pa., has recently placed an order for two 103-C Bucyrus electric shovels for use in their quarry operations.

Six barges, carrying 1,200 tons of silica sand for use in foundries, docked at the terminal incline, East St. Louis, recently. The vessels are the first of a fleet of freighters operated by the American Inland and Overseas Company of Chicago, between Ottawa, Ill., and St. Louis.

The company holds contracts for the transportation of 40,000,000 tons of sand for use in the manufacture of steel and malleable iron.

According to John H. Bullock, general manager, the company will operate three steamers and thirty-two barges. It is estimated that in the course of nine months the barge line will free 4,400 box cars and 110 locomotive s for other use. Hauls that formerly required thirty days by rail will be made in a week by the barge line.

The Dolomite Products Co., Rochester, N. Y., are opening up a quarry in the Lincoln Park, N. Y. They have a very fine fluxing stone and it is their plan to be ready by next Spring to handle 1,500 ton of rock per day. They are now installing a large Kentucky crusher.

The Geneva Stone Corp., at Oaks Corners, N. Y., started operation about September 1, and is now making about 400 tons of crushed stone per day. The capacity of the new plant is about 1,000 tons per 10-hour day. The primary breaker recently installed is a 30-inch Superior McCully gyratory. The quarry is operated by steam shovel. The crushing plant is electrically operated throughout requiring 350 h. p. An electrically operated well drill is also used.

W. L. Sporborg, president of the Rock Cut Stone Co., Syracuse, N. Y., represented the crushed stone interests at the hearing given by the Public Service Commission of the Second District, State of New York, on the increase of freight rates, held at Albany on the 17th. This meeting was held to give the different shippers of the state a chance to be heard. The crushed stone companies of the state have had a hard time this year. They have had the usual labor troubles, hard work to secure coal and cars. They objected to the state granting the increased rates within the state.

H. S. Holland, 105 N. Sheppard street, Richmond, Va., is forced to relinquish his stone-crushing business at Boscobel, Va., and offers for sale at public auction his entire plant, consisting in part of boilers, engines, three Gates crushers, hoists, elevators, screens, pumps, together with buildings and all quarry equipment. One Marion steam shovel, one Keystone well drilling machine, etc.

C. J. Carey, 214 Ninth street, Milwaukee, Wis., has for sale or lease granite quarry, 40-acre ledge, three-fourths of mile from main line C. & N. W. Ry. and six miles from Montello, Wis., quarry. Suitable for crushed stone and paving blocks for road purposes. Great opportunity for company to work quarry on royalty basis.

H. H. Hanenkratt, Kansas City, Mo., has been awarded contract for stripping approximately 20,000 cubic yards of earth for Beyer Crushing Co. at Swope Parkway and Agness street, Kansas City, Mo. This stripping is being done by a new 18-B Bucyrus caterpillar steam shovel.

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is distributing Motor Application Circular No. 7132, entitled "Electrification of Excavating Shovels," which describes and illustrates the various uses to which electric shovels may be put, such as quarry, pit and railway work, coal mining, and dragline excavating. The method of electrifying is discussed, together with an outline of the choice of equipment. Advantages of electric shovels are fully considered and results of recent tests are given, which show the cost per cubic yard of material removed by means of these shovels.

Tables are produced which show the approximate energy consumption of electric shovels and dragline excavators.

According to advices from Sedalia, Mo., approximately 35,000 pounds of dynamite was exploded recently in a large limestone hill to provide rock for the Missouri, Kansas & Texas Ry. Co.'s crusher at Sweeney, Mo. Men have been at work 18 months drilling holes in the rock ranging from 35 to 100 feet deep to carry the charges of dynamite. The section blasted out of the hill was 100 feet deep, 220 yards long and 150 feet wide. As the electric switch was thrown, the side of the hill was seen to heave outward, enormous slabs of rock being thrown from 150 to 200 yards in the air.

A. Courchesne, Inc., El Paso, Texas, recently constructed a reinforced concrete round lime kiln, 8x50 feet, with coal for burning and electricity for power. They have an almost unlimited supply of both high calcium and magnesium limestones and have ordered hydrating machinery, including new hydrator, Sturtevant No. 1 open door rotary crusher and a pulverizer and air separator.

A 2½-ton Traylor motor truck left Allentown, Pa., at noon, June 23 ,and arrived in Chicago, 11:30 a. m., July 3, after covering a distance of 1,037 miles. The cargo, weighing 5,800 pounds, consisted of plates for a Traylor jaw crusher in the plant of the Chicago Union Lime Co., and diaphragm liners for a Traylor gyratory crusher eccentric shaft for the Chicago Gravel Co. The return cargo consisted of Buda motors loaded at Harvey, Ill.

The trip was made to deliver the repair parts in less time than required by the railways and to test out the axles. The motor was governed for a maximum speed of 15 miles per hour.

This truck was made at the Cornwall plant of the Traylor Engineering Co.

In the actual loading, tamping and wiring of charges in drill holes there is little variation of method, and relatively little labor is involved; hence no appreciable amount of labor can be saved by modifying the mechanical processes connected with blasting.

However, efficiency in blasting has a direct bearing on the amount of labor required subsequently. Improper arrangement of drill holes, imperfect balancing of charges, or the use of too strong or too weak an explosive, may result in a very inefficient blast, and, as a consequence, the loading of rock may be greatly hampered. In fact there is no other department of the quarry in which inexperience or lack of judgment may in a brief period occasion more disastrous consequences.

This is particularly true where many large blasts are fired simultaneously in deep churn-drill holes, for the mass of rock thrown down may occupy the rock loaders for a period of several weeks or even months. If the rock is imperfectly shattered, or improperly thrown down, excessive secondary blasting may be required, and the loading may be slow and difficult throughout the entire period. Hence, it is false economy, both of money and labor, to employ inexperienced men as blasting foremen.

A realization of these facts has led some operators to engage the services of blasting experts, who are not permanent members of any quarry organization but travel from quarry to quarry as their services are desired. Such an expert, in accordance with the judgment gained by long experience, supervises the arrangement and spacing of drill holes, selects the explosive, proportions the charge for each hole, carefully inspects or tests all connections, and fires the charge. The efficiency of the results usually obtained amply justified the employment of such experts.

If, on the other hand, blasting is done by an experienced man of good judgment, the subsequent operations may be greatly simplified. If the rock is thoroughly shattered, little labor is required for secondary blasting, and if the rock fragments are thrown down in a way that permits easy handling, loading may be done rapidly and with minimum effort.

The Pennsylvania Lime Products Co., with main office at 308 Chestnut street, Philadelphia, Pa., has about completed re-equipment of its plant at Bridgeport, Pa., installing electricity throughout, for the manufacture of building lime. Electric motors have been installed throughout the plant in place of former steam appliances. A tramway has been installed to carry the material to crushers and kilns. Kilns have been rebuilt, also a new apartment house for the employees has been completed. The plant is running in good shape and with a good production. The company has arranged for the installation of a lime hydrating plant, and a building for the manufacture, and a warehouse will shortly be erected.

The Humboldt Gravel & Tile Co., Mr. F. Goodrich, manager, Humboldt, Iowa, reports business extra good and prospects very bright for the coming season. They operate a No. 5 Austin gyratory crusher and excavate and load their material with a Link-Belt locomotive crane equipped with a 1½-yard clam shell bucket. Have daily capacity of 2,000 tons. The company expects to build a new plant at Milford, Iowa, within the next six months to have daily capacity of about 1,000 tons. An 80-acre tract of land has been purchased, and a fine pumping, washing and grading plant will be installed.

Measuring Concrete Quantities

A Letter From Frank H. Fraser, Sheridan Concrete Construction Co., Sheridan, Wyo.

I would like to hear from some of your contributors as to the advisability of adopting a standard of measurements in the concrete industry, similar to measurements in the allied trades, such as brick, stone or plaster work, with their unwritten customs of measuring openings, corners, panel work, and projections. I find on one of my jobs this year—a state highway bridge with panelled railing (quantities given in specification)—that panels 1¼″ deep, chamfers 3″ x 3″ and splays 3″ by 1″ are deducted from total. In any other branch of the building trade these would have called for an extra item over plain work.

This is one suggestion that may be interesting to others of your readers.

News of the Concrete Products Factories

The elementary period in the manufacture and use of concrete products is over, and a certain amount of prestige for the material has already been acquired. A thorough popularity of the products, however, has not yet been attained and will not be attained until a large majority of the concrete products made are of unquestionable quality.

Leading manufacturers of concrete products today have a very good understanding of the material they are using, their problem in manufacture, and of the requirements of the products in service The manufacturer so equipped with knowledge and experience can safeguard his customers—the users of concrete products—but he cannot but feel the injustice done to his business by those who through ignorance, carelessness or willful neglect, put an inferior product on the market for the same purpose. Permanent success of any manufacturing industry is dependent on the quality of the product made and the success obtained in the use of the material. The concrete product is no exception.

The Hansel Coal Co., a coal and building material firm at Kokomo, Ind., have in operation a large modern factory for the manufacture of concrete brick and blocks (Ideal machines). The plant is equipped with modern machinery of the latest improved type including a Blystone mixer, and in addition to the block industry, they also manufacture concrete drain tile of all sizes, ranging from four to twelve inches, having purchased a Dunn Automatic tile machine. Almost every appliance for the quick handling of cement, sand and coal has been installed at the new plant. Bulk cement in carload lots is unloaded in bins by special conveyors. This plan, it is pointed out, saves considerable manual labor, and prevents waste. The steam dry room for the drying of cement blocks is one of the features of the plant. For their brick they receive different prices, $16 per 1000 up. Cellar blocks bring 22 cents and rock face 24 cents.

T. T. Harrison, general manager, the Constant Sand and Gravel Company, Box 75, Denham Springs, La. recently organized capital stock $125,000 advises us they expect to put in a plant for manufacturing concrete bricks, building blocks, fence posts and other products made of sand and cement.

T. A. Smith operates two local gravel pits at Paw Paw, Mich., and he contemplates the manufacture of concrete blocks, bricks and posts.

W. R. Green, who operates two sand and gravel pits at Sioux, Falls, S. D., is planning to make cement blocks this season.

To convince prospective builders of the economy of concrete block construction the Cast Stone Co. of St. Paul, Minn., compiled some figures covering detailed costs of one cubic foot of wall comparing faced and plain block of their own make with other kinds of masonry.

"What will it cost?" is one of the questions which must be answered by every man who is seeking wider markets for his block. The table below is helping the Cast Stone Co. to give an answer to its customers. These figures may be modified to meet local price conditions elsewhere.

Further interesting figures on the cost of a complete house are furnished by the Halifax Relief Commission which is rebuilding the part of Halifax destroyed by a munition ship explosion two years ago. Estimates were prepared for a two-flat house 28 by 29 feet with the following result:

No. 1 Frame and sheathing covered with dipped and stained shingles.....100.0%
No. 2 Frame and sheathing covered with drop siding 101.2%
No. 3. Granite-faced concrete block (Hydrostone) 103.0%
No. 4 Frame with Bishopric stucco board and cement stucco.....104.2%
No. 5 Frame and sheathing with metal lath and stucco 105.6%
No. 6 Frame and sheathing with brick veneer 106.9%
No. 7 Brick, 8 inches thick.....108.8%
No. 8 Monolithic concrete, 8 inches thick, outer surface rubbed.....116.0%

These figures are especially interesting because they show that concrete block houses cost only slightly more than 1% over the ordinary frame house.

The shifting of price levels in the past four years has upset most former ideas of comparative prices. Up to date figures such as have been given will show that concrete construction is relatively cheaper than it ever has been and that all things considered it is by far the most economical material for residence construction.

Cost Per Cubic Foot of Walls of Various Materials Compiled December 1, 1919, by The Cast Stone Co., St. Paul, Minn.

Straight run of 12-in. thick wall using combination of materials as listed to the right.	Sp. Faced Cast Stone	Unfaced Cast Stone	Tamp Block With Stucco	Face and Common Brick	Face Brick and Tile	Common Brick Throughout	Load Bearing Tile Throughout
Cost of material per cu. ft. of wall (3 mile haul)	$.357	$.28	$.255	$.504	$.508	$.336	$.323
Cost of labor per cu. ft. mason and helper ..	.08	.08	*.15 .088	.285	.242	.175	.095
Mortar cost	.023	.023	.022	.05	.035	.05	.03
COST OF WALL PER CU. FT. LAID UP	.46	.383	.515	.839	.785	.561	.448

In computing the above costs the following figures were used:

Brick and Tile Mason per day.....$10.00
Block Mason per day..... 10.00
Helpers time per day..... 5.00
Face Brick per M..... 40.00
Common Brick per M (sand lime):..... 16.00
Tile (Load Bearing)..... 95.00
12" cast stone (sp. face 10c ex) ea, (8x12x24) .37½
Tamp block delivered 6x12x24..... .25½
Stucco per square foot..... .15
Mortar per cubic foot..... .52

Material laid by mason per day:

Common brick 1500
Face brick..... 500
Tile..... 450
Cast Stone..... 125
Tamp block..... 150

B. W. Harmon, City Engineer, Maryville, Tenn., has designed a novel concrete sewer manhole which is cast in rings and by adding separate sections can be made any desired depth.

Mr. Harmon states that the principal advantage of this manhole is the short time needed for its erection. In wet weather its joints will not fail, as sometimes happens with brick construction.

The American Concrete Products Co., S. B. Lovejoy, manager, 1245 Circle Ave., Forest Park, Ill., are manufacturing a patented ornamental concrete post for street lighting and they are turning out a very high grade product. Just now they are delivering an order for Maywood, Ill., to be used about their park, and a large order for the Standard Oil Co., to be used at their service stations. The product is going to all parts of the country, selling on its recognized merits of durability, beauty and utility.

They make three heights, the Boulevard post, thirteen feet high; the Broadway, ten feet high, and the Utility, seven feet high. While they have a great variety of patterns, the company is specializing in an octagonal design, which is really a beauty.

The company began business last year, and it is meeting with excellent success. The beauty of the posts is enhanced by a mixture of mica in the concrete, which when treated with an acid solution brings about a sparkle to the surface which is quite unusual. Each post contains a heavy iron conduit of the full length, through which the electric wires pass, and it is further reinforced by a number of heavy steel rods, also extending from the base to the top. Any kind of electrical fixture will fit the posts and they are marketed quite generally through the various electrical supply houses.

A feature which makes them very desirable for ordinary street lighting is that of having the name of the street in bronze letters cast in the surface of the post.

The Playford Mfg. Co., Elgin, Ill., manufacturers of stave silo molds, have purchased new buildings at Logansport, Me., where they will be located hereafter. The company has been reincorporated under the laws of Indiana and its capital stock increased to $150,000. Mr. S. W. Sider of Logansport has obtained a working interest in the company and becomes treasurer.

The Valley Silo Company, M. J. Baker, secretary, Fargo, N. Dak., write that interest in stave silos is growing rapidly in their territory and they shall be unable to supply the demand this year. They contemplate doubling the capacity of their Moorhead plant this year and possibly establishing a plant further west. They declare that North Dakota will absorb 1,000 of stave silos per year within a comparatively short time.

The Slayton Concrete Block Co., Dearborn, Mich., has been incorporated with a capital of $10,000.

The Prichard Cement Products Co., Box 993, Mobile, Ala., has recently completed the erection of its new plant. They will use Ideal block and brick machines. Will also install in the near future molds for making brick, sewer pipe, fence posts, drain tile and vases. Are interested in white silica sand, waterproofing compound and concrete mixers. They get 32 cents for their blocks and $18.00 per thousand for their brick.

S. D. Lindsay, 407 Long St., Orlando, Fla., manufactures a 3-face block machine for which he has quite a number of orders, but cannot get them made rapidly enough in the shops or foundries in Florida, therefore he wants someone in the north to make them for him or sell them on a royalty basis. The machine is light, simple and neat in design. It is quick and easy in operation, and has capacity for one block per minute. It makes from the smallest size blocks up to 14x16x24. Either wooden or cast iron moulds can be applied quickly and it makes a hollow or solid block.

Francis Angus, 321 South Fourth St., Grand Haven, Mich., has taken over the concrete block factory of Peter Ball and is at the present time conducting operations there. Mr. Angus has also purchased a considerable portion of land running back into the sand hill in the rear of the property from which he will take sand for the manufacture of blocks. While it is true he can make blocks cheaper than the average block manufacturer as he is located on a sand hill, yet in as much as clay products are made many hundred miles away it seems possible for Mr. Angus to get more than 13 cents for plain blocks and 14 cents for rock face blocks. The block makers of this vicinity should get together and establish a better price and stick to the new prices. Mr. Angus will increase the capacity of his factory, having ordered an Anchor electric tamper and a Hobbs block machine. At present he operates an I X L Burrell block machine and a Coltrin continuous mixer.

Co-operation, not competition, is the life of trade.

A contract was laid before the city commission of Joplin, Mo., recently by a representative of the W. S. Dickey Clay Manufacturing Company of Kansas City.

"That's the price on vitrified pipe for your new sewer system," he said. "Tomorrow you will have to pay $16,682 more or approximately 13 per cent more to get the same goods, for an advance is being announced today."

The commission, however, waved the contract aside. In a battle that has just been waged between clay and concrete, it gave the decision to concrete. Joplin's new sanitary sewers, which will be constructed at a cost of about $291,500, will be made of concrete pipe.

Mahoney on Inspection Trip.

The decision followed a three-day "gum shoe" trip by O. P. Mahoney, commissioner of streets and public improvements, to St. Joseph, Mo., Kansas City and Waterloo, Ia., to investigate the relative merits of concrete and vitrified sewer pipe. He informed the commission vitrified pipe absorbs virtually the same quantity of water as concrete and that concrete is no more susceptible to the action of sewage acids than vitrified pipe. He also presented a letter from engineers at Kansas City to show that in ten years that concrete pipe has been used for sewerage there, no section has proved faulty from acid attacks.

"Moreover, I have a guarantee from J. L. Zeidler of the Pioneer Manufacturing Company at Waterloo to furnish concrete pipe at the present market price of vitrified pipe, or for less, and the city is protected despite the fact that the price of vitrified pipe is advancing and the Dickey company is the only one from which we were able to obtain a proposal," he declared.

Mahoney suggested to the commission that it would be a good plan to obtain a machine for making concrete pipe, in sizes from 12 inches to 30 inches, at the sides of the ditches in which it would be placed.

"On the smaller pipe up to 12 inches in diameter we can insure immediate manufacture," he said. "That means we can proceed at once with the building of the Villa Heights, Chitwood, Castle Rock and a big part of the Shoal creek sewerage projects; and within ninety days we can obtain the machinery for making the bigger pipe."

Louis Moski, 1148 E. 28th St., Erie, Pa., operates a Besser automatic power block machine which gives entire satisfaction. With four men he makes 1,100 blocks in eight hours.

The Granite Brick Co., John R. Woods, president, A. J. Probst, superintendent, Rising Sun, Ind., recently organized, have completed their new factory and are in a position to handle a rapidly growing business. They operate a Helm block and brick press and a Jaeger mixer. The blocks sell for 20 cents and the brick for 25 dollars per thousand. They use mica spar crystals and also want prices and samples of crushed white marble.

The Besser Sales Company write: "It is not possible to establish a successful concrete brick business at the present time except through the use of large quantity output automatic power tamp machines which will produce a very highly compacted dense product capable of meeting the most exacting building code, engineering and architectural requirements.

"We feel that in the large capacity automatic Besser brick machine we have machinery which exactly meets such requirements and we court the most exhaustive investigation both of the machinery and its products.

"The machines are made in two sizes. The number 1 makes eight brick at a time, 12½ operations per minute or 100 brick per minute. This is at the rate of 60,000 brick per 10-hour day. The smaller or number 2 machine, which is identical with the number 1, excepting in matter of capacity and proportionate size, has a capacity of 30,000 brick per 10-hour day. The number 1 machine with the mixer and mixer loader attached sells for $10,750 and the number 2 machines with the mixer and loader sells for $5,750.

"Both machines are absolutely automatic. The materials are mixed, elevated, fed into molds and tamped without the interposition of hand labor."

The Yakima Cement Products Co., Yakima, Wash., is building an addition to its plant to accommodate an elevator and bunkers to hold their cement and gravel before it is mixed. An electric Anchor tamper and Hobbs block machine is being installed. The electric machine furnishes more uniform power and eliminates labor, according to Manager W. P. Hewes. The company has recently added seven steam kilns or curing rooms to the equipment. They operate Peerless brick machinery, Blystone mixer, Playford Rib-Stone silo molds and Automatic Sealing Vault Co.'s burial vault molds.

W. H. Cochran of the West Virginia Concrete Burial Vault Co., Wheeling, W. Va., reports splendid business and bright prospects. He writes: "Our vault business has doubled every six months. I am in the contracting business and am making arrangements to give it up and push the vault business all the harder as I know I'll have all the vault business I can handle in this one plant. I have no trouble selling the vaults—people ask for them and the undertaker supplies them. I supply the undertaker."

Paul Chapman, 1364 Burton St., Flint, Mich., operates an Ideal and Miles cement block machines in his plant and a Blystone mixer. His blocks sell for 27 and 30 cents and are made of washed sand and cement, 2 and 1 mix.

The Granette Products Company of Des Moines, Iowa, is busy manufacturing architectural concrete trim, for which they are developing quite a demand. This company realizes that quality products mean success and they are not sparing time, money or material to produce high grade products.

The Silo Company, 315 Dakota Life Bldg., Watertown, S. Dak., recently organized, has for its purpose to sell and erect cement stave silos, having contracted with the Watertown Tile & Con. Co., Watertown, S. D., for 50,000 staves this year. "We are quite decided," states Mr. H. E. Kendree, president, "that the need of silos in this community and surrounding counties is fast growing. We are putting out with our silo this year, two kinds of doors—wooden doors and concrete door frame with wooden door swinging on hinges, the latter preferable, because doors are intact and not at the other end of the farm at silo filling time."

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent continuous mixer, which is especially designed for concrete products plants. Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy. Write the Kent Machine Company, 130 Second Avenue, Kent, Ohio, for catalog and prices.

The Northwestern Steel & Iron Works, Eau Claire, Wis., anticipates an active season on their tile and culvert forms. They point out that the use of these especially in road work effects large savings in iron and steel as well as of railroad tonnage and car space, as all of the materials generally are procurable locally except the cement and reinforcing. Another feature in their favor is the effective use of local unskilled labor. Two styles of tile made with their forms—the concrete (without reinforcing) and the reinforced. Full information for making concrete culvert drain tile is contained in their new Bulletin No. 29. Write for a copy.

The Pontiac Tile & Brick Co., Pontiac, Mich., have their plant in operation and are in a position to handle a rapidly growing business. They manufacture the McIntyre concrete building tile, using a Blystone mixer.

T. Fuller & Son, Grundy Center, Iowa, are contemplating enlarging their cement block business in the near future and have already ordered new machinery for the same. They are also endeavoring to obtain a tract of ground near the railroad tracks on which to locate their plant and they will use their present quarters for storage, it being too small for the enlarged business.

Cement and Engineering News

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Prices of Cement To Remain High

Lower prices for Portland cement are not considered likely to come about before 1922.

Some of the prominent manufacturers over the country have issued statements to the effect that they do not look for any overproduction of cement next year and they consider that the possibility of a price reduction depends on the supply of coal and labor. They assert that scarcity of labor is the chief difficulty confronting cement manufacturers, and with coal prices high, costs of production have been soaring.

On account of the conditions with which they have been confronted cement plants have been operating at only part capacity since early last season, and the country's production has fallen short of requirements by a wide margin. That resulted in tying up road building projects to a great extent over the entire country and considerable work was held up owing to inability of contractors to obtain any assurances regarding cement supplies.

Demand for cement this year is estimated to have been unequaled in the country's history, but owing to shortage of cars the mills were unable to bring in their supplies of limestone and other materials in adequate quantities. Production of cement in the United States this year is estimated at 85,485,000 barrels as compared with 70,915,508 barrels last year and 94,552,296 barrels, the high point set in the industry, in 1916. The output in 1914 was 88,230,170 barrels.

Our Vast Unused Energy

The increased costs of fuel and the state of available fuel reserves, which, according to the latest report of the Federal Reserve Board, "continue to be of the most limited character" and will necessitate "much more energetic action if industrial conditions are to be made safe for the coming Winter," are forcing our attention as never before upon the need for more economical power, the Guaranty Trust Company of New York states in a survey of the resources and development of water-power in the United States.

Probably the most significant achievement in the field of American industry in the post-war industrial readjustment is to be the development on a large scale of the nation's vast water-power resources. With the revival of normal industrial activity by the recently belligerent nations, competition in the world's markets will become increasingly severe. Economy in the application of power to the production and transportation of goods will in large part measure the competitive ability of the various nations. As emphasis is more and more placed upon cheapness of power resources, coal and iron alone henceforth will not be such decisive factors in measuring the potential industrial capacity of nations. Water-power will have a new significance as a national asset. It is estimated that the United States has the means for effecting a saving in the matter of its energy supply of well in excess of a billion dollars a year. For the most part this saving can be effected only through a fuller utilization of the nation's water-power resources.

The Federal Government's control of the development and use of water-power has been liberalized by the recent Water-Power Act. Already there is under way a survey of the power resources of the Atlantic seaboard between Boston and Washington by the United States Geological Survey under the special direction of Congress. A proposed plan of development in this region is being considered whereby, through the co-ordination of hydro-electric enterprises with steam generation of electricity in the mine fields and at convenient points elsewhere, an estimated saving of $300,000,000 annually is to be effected.

Buying Cement from Competitors

We wish to call your attention to an act of injustice that is being perpetrated on us by the cement manufacturers in this district, writes Mr. E. A. Barnes, Pres., Sandringham & Co., Oklahoma City, Okla., to-wit, by forcing us to buy cement through lumber dealers and brokers who, in addition to selling us cement at a neat little profit of from 15 to 25 cents per barrel, are also selling other materials in direct competition with our products and doing everything in their power to promote the selling of their lumber as against our brick, yet we are able to and do pay cash for cement and take advantage of the discount, and have a plant representing an investment of approximately $50,000 and are as thoroughly reliable as any lumber dealer in the state.

We will be in a position to use 100 cars of cement a year, or an average of 8 cars, a month, the year round. If the lumber dealer is allowed to milk us to the extent of $40 a car profit, without having one cent invested, without even seeing or touching the cement in any manner, it will mean about $4,000 per year profit for him, and it makes it just $4,000 a year harder for us to make a success of our business.

We contend that the cement manufacturers are acting in a very short-sighted manner in this matter, as

we are manufacturing a product which means entirely new business for them and we should be encouraged and aided in the upbuilding of our business instead of allowing us, or forcing us, to divide our profits with concerns who are not interested in the marketing of our products and who are pushing their own wares wherever possible, directly in competition with the cement products man.

We are asking that you take this matter up personally with the cement manufacturers and use your utmost endeavor to have this matter remedied, if possible, to the extent that we may be enabled to purchase our cement direct from the manufacturers.

Big Building Boom Coming

New buildings of all kinds—factories, stores, garages, banks, churches and schools are needed. There is a large amount of repair work to be done. Delayed construction is being speeded up and next year will likely see the biggest building boom in the history of the country.

Men who put their money into buildings today demand permanent fireproof construction. Concrete block meet modern building requirements in a most satisfactory manner. Plain block provide a firm and generally satisfactory backing for stucco, making possible a uniform color in the finished exterior and requiring only a single coat of stucco. Smooth and tool faced block produce attractive walls. Concrete building trim, such as sills, lintels, cornices, chimney block and a variety of special pieces are used with both stucco and block surface and frequently with brick surfaces. Such units are specially adapted for porch and similar construction. They are in wide demand throughout the country. In a number of cities, concrete building trim has already become a standard product for practically all classes of structures, almost regardless of what material the body of the wall is built.

An example of the extensive use of concrete block is in Halifax, N. S. When a large part of that city was destroyed by the ammunitions explosion in the harbor in December 1917, the Halifax Relief Commission, which had charge of rebuilding the city, adopted concrete blocks for 326 dwellings, while a total of over 800 buildings of concrete have been completed. Their many points of superiority rather than their reasonable cost were responsible for the selection of concrete block for this important rebuilding program. A similar example is furnished by 640 houses built for the Bethlehem Steel Co., by the United States Housing Corporation. Concrete wall tile equivalent in volume to 10,000,000 brick were made for this project. Original plans called for the use of wall tile in foundations only but they proved so economical to lay that it was decided to employ them for building walls.

An Necessity and an Asset

Advertising today is a necessity and an asset. The time has arrived when the manufacturer and the merchant must carefully figure advertising cost and carry it in his budget as an expense just as essential as rent or labor, properly charging it against each product and article. Advertising has been hurt by emotional appropriations, by spasmodic flares. For instance, some men still advertise only when they have spare money and never put out a line when times are dull and they need business! The amount and nature of advertising is to be planned with the production scale. Only then can we stabilize manufacturing, merchandising and advertising. The manufacturer or merchant who is advertising sanely today is not only laying the foundation for greater business for himself, but is selling the public on his industry. His success will be the guide post for his competitors, and the post will always read, "Advertise."

—*Edward N. Hurley.*

The Purchasing Agent

In an address following his election as president of the National Association of Purchasing Agents at the annual convention held in Chicago on Oct. 11, 12 and 13, W. L. Chandler of the Dodge Sales and Engineering Company, Mishawaka, Ind., said in part as follows:

"There are two well known types of purchasing agents: the rubber stamp variety and the executive kind. The rubber stamp type of purchasing agent buys what he is told to buy where he is told to buy it and when he is told to buy it. Such a purchasing agent bears about the same relation to the corporation as does the nightwatchman—and yet there is some difference between the rubber stamp type and the true night watchman type.

"When the president of a corporation goes home at night he feels perfectly safe—he knows the nightwatchman is on watch; that if a fire occurs the alarm will be given promptly, or if an attempt is made at a theft, the nightwatchman will do his best to prevent it. The president probably has a very similar feeling in regard to the rubber stamp type. He feels confident that this trusted employee is guarding the interests of the corporation against the payment of duplicate invoices or any and every kind of fraud.

"While the chief executive of the corporation may feel perfect confidence in both the nightwatchman and the rubber stamp types, there is another point of similarity between the two and that is this: the directors of the corporation never consult either in regard to the big question of large or unusual purchases.

"On the other hand corporations employing purchasing agents of the executive type know by experience that this official is thoroughly informed on market conditions and that he had definite and sensible ideas of when to go into a market and when to stay out of a market.

"He knows enough about banking matters that he may intelligently discuss with the directors the problems of financing large purchases at a time when market conditions are favorable and all in all he is a well balanced individual.

"At the present time it is taken for granted that the president, secretary and treasurer of any corporation are, by virtue of their offices, members of the executive board or the board of directors.

"A number of corporations have already seen the wisdom of extending this plan of selecting the personnel of the directing board to such a point where they include in that committee or board, the following executives in addition to those named: Purchasing Agent, Sales Manager, Advertising Manager, Production Manager, Credit Manager and—on occasion—the Personnel or Welfare Manager. On such a board only the executive type of purchasing agent may hope for a seat.

"When an expert committee composed of these officials hold a conference, every department in the business is represented by men thoroughly familiar with their own phase of the industrial unit and competent to discuss to a finish any problem which may develop."

Exposure of a Confidence Game in the Building Industry

By C. A. P. Turner, Minneapolis

A country wide attempt to victimize owners of flat slab structures is now being industriously prosecuted and requires only the light of publicity for its undoing. Like the bulk of semi-legalized business dishonesty, it is founded upon a miscarriage of the United States Patent system, described briefly as follows:

In 1906, Turner built the first commercially successful flat slab and column construction as everybody in the building business knows. The reason for its success was the discovery of elementary relations governing the distribution of twisting and bending resistances in such plates essential to success.

After a seven years contest in the patent office a broad patent was granted as a result of the favorable decisions in two interference contests in which the examiner held that Turner had achieved that which engineers and practical men had regarded as impossible and of the prior art it might be said that it utterly failed to disclose or even suggest the subject matter of the invention. The Norcross patent, Matrai structure, Speer, Seely, Folder No. 14, and other flat arch references were duly considered, examined and discussed.

In the first suit under these letters patent the structure which the patent office had held was such an unusual invention, was decided to be an aggregation upon the very references considered by the office, to-wit, Matrai structure of 1894 patent, described in the Ciment Arme publication of 1900 or thereabouts.

Drum vs. Turner decision followed the Turner vs. Moore on aggregation in the same Eighth C. C. A., 219 Fed. 199, in which the principle which Norcross patent says on its face is that of disposing the material following the rule for flat arches was held to be the same as the Turner construction of the continuous plate.

Norcross had secured the allowance of rejected claims in the patent office only by filing a disclaimer of all forms of rolled iron as reinforcing ties. The trial court dismissed the case on the ground that in disclaiming all forms of rolled iron Norcross had disclaimed the 5/8-inch rolled iron rods of defendant's structure as well.

The Court of Appeals reversed the trial court and its former holding of aggregation against Turner by so doing since it could not be true that the Turner structure was a mere aggregation under the Hailes vs. Van Wormer decision in the light of references and publications of 1894 and prior thereto so that there was nothing left for patentable invention in placing the customary pieces of metal here or there or turning them this way or that in the mass of concrete, if he could possibly infringe a true and valid patent applied for seven years after the published references which reduce according to this court of appeals his invention to an aggregation.

An effort to harmonize these irreconcilable holdings appears in the language of the decision in Luten vs. Washburn, quoting, with approval Judge Hook in Deere and Webber and Turner vs. Moore, etc., to the effect that the evidence of prior practice in building and prior publication shows that little was left for patentable invention in placing the customary pieces of metal here or there and turning them this way or that in the mass of the concrete, but in Drum vs. Turner 219 Fed. 188,—"we sustained the Norcross patent for a metallic concrete flooring without supporting beams." The invention in that case was for a floor without supporting beams, not merely the location of the reinforcing rods.

Thus a flat arch which with its steel tie rod in the bottom is beam in principle is held by the court to be without beams, but if it be true that the flat form and not the arrangement of the reinforcement is the thing held to be new, it is seen to be old in the publication of the details of the structure of the Model Power House in the Engineering News of 1899, more than two years prior to the date of application for the Norcross patent.

The holding of that which was old in its specific features to be new, seemed at first to the writer to involve a constitutional question. Upon referring this question to counsel, the following opinion was received:

"If you are rightly understood therefore, the infirmity of the decision amounts to no more than this, namely, that the court erred in holding the Norcross patent valid regardless of the statutory antiquity of the invention. This was outrageous, but not apparently unconstitutional, for this court has the constitutional right to make blunders of all kinds, subject only to correction, in patent cases, by certiorari from the Supreme Court."

The only redeeming feature to be credited to an erroneous holding according to this advice is whenever a court decree is antipodal to or contradictory of scientific fact or mathematical truth it constitutes a legal fact in the fiction of the law *which is binding upon the litigants* only but *not upon the public at large.*

The decree of infringement in Drum vs. Turner was followed by the distribution of letters sent broadcast over the country, belittling the Turner accomplishment in making a success of the flat slab floor, misrepresenting the scope of the decision of the court, falsely asserting that the ordinary denial of a write of certiorari by the Supreme Court constituted a decision by that high tribunal of the final validity of the Norcross grant. This mis-statement of fact was industriously circulated as a means to levy tribute on the public at large under threat of immediate suit against those who failed to pay royalty on a flat arch when building a continuous plate and in fact the holders of this flat arch patent had the audacity to recommend to their alleged licensees that they follow the identical disclosure of the Turner patents and not that of the one they pretended to collect royalty on.

The finding of infringement was followed by an Accounting, during the course of which the Flat Slab Patents Company experts admitted as the record shows that they had never built, never tested and never even seen a flat slab and column construction with the steel in the bottom throughout where the Norcross patent discloses it and claims distribute it following the rule of distributing metal in flat arches.

With the friendly co-operation of the Master, evidence of the worthless character of the Norcross patent disclosure was objected to by the plaintiff and barred from the record. Not only did plaintiff fail to assume that burden of proof apparently required under Supreme Court decisions, but prevented the defendant from outting in such proof. The state of the case today is as follows:

The Court of Appeals after considering the Accounting testimony for over a year, failed to come to a conclusion. The presiding judge, sitting on the bench to determine the profits or damages is the same jurist who wrote the opinion in Turner vs. Moore

that the flat slab was an aggregation on old references. The case was ordered up for rehearing last January and no decision has yet been rendered.

The Norcross patent expired a year and a half ago. Royalty can therefore not be collected thereon because the grant is dead. Damages may be sued for but no interference with the use of the structure is possible.

Bringing forward a decision dealing with technical infringement as a basis for a claim for damages when the court has not decided the question of damages at all nor finally considered the apportionment of profit just as though the determination of a technical infringement of a paper patent in equity determines the damage that can be collected for the use from a party not a litigant and upon whom the decision regarding infringement is not binding as a legal fact when well known to the parties making the claim does not constitute as the writer views it an honest method of procedure. This is doubly so when we consider that if the plaintiff in the litigation ultimately succeeds in collecting damages or profits from the defendant, he is thereby estopped from collecting the same profits or damages from a second or third party not a litigant upon the self same use or infringement since it is hardly likely that any court can be found that would sanction and support such an inequitable procedure.

Looking at the matter from the standpoint of public interest, aside from that of the confidence game and obtaining money thereby, such a decision as Drum vs. Turner contains the same potential menace to public safety that a derelict mine presents when adrift in a steamship lane. The decision holds in fact that putting the steel in the top of the floor is the plain mechanical equivalent of putting it in the bottom. The distribution of this decision broadcast might readily cause a not over bright foreman to conclude that the court actually knew something about the matter and to reverse the position of the steel in the engineer's design from the bottom to the top where it should not be and from the top to the bottom where it should not be, thereby menacing the safety of workmen or perhaps killing a dozen or more of them.

The public indeed needs the protection of a competent patent Court of Appeals. The only objection which has been urged against such court by United States Congressmen and Senators, is that it would be expensive. The government, however, is supposed to look after the interest of the whole people in a business like manner. Not by that kind of efficiency which is sometimes termed saving at the spigot and losing at bung. The saving of a few dollars in the salaries of a competent court at the expense of the public where an erroneous decision of a single court where the judges receive a salary of $7,500 a year or thereabouts may cost the public at large a quarter or a half-million, is just that particular kind of economy which appeals too often to Congressmen and Senators. It may be stated without fear of contradiction that the public is fleeced ten times the amount in dollars and cents every year by erroneous decisions on scientific questions in patent cases that is taken from them by the entire fraternity of bank robbers, burglars and holdup artists through the country at large.

The potential danger of decisions like Drum vs. Turner above noted point clearly to the fundamental defect of the present system. The determination in law of scientific questions is based upon belief in the mere hunch or impression of the court as to the creditability of the witness. No attempt is supposed to be made to analytically apply fundamental mechanical laws and truths which have been developed from a scientific beginning at the time of Archimedes by the greatest mathematicians and philosophers which the world has produced since. Advantage is taken of the analytical application of these principles by every business and scientific man. Only in law are such questions settled by the dark age method of belief rather than reason.

The Drum vs. Turner decision in all its crudity from the engineering standpoint is a logical deduction from the commercial testimony of a member of the Joint Committee on Concrete and Reinforced Concrete. Lacking in knowledge of the art, the interpretation arrived at by the court that putting the steel in the top of the floor is in fact the plain mechanical equivalent of putting it in the bottom is logical,—in fact inescapable if this testimony was to be believed. Also that the distribution of rigidities, whether the steel covered the area or not, would produce the same result and from such conclusions we have the conditions that the public at large are levied on for tribute for the benefit of the patent speculator, the holder of a paper patent which accomplished nothing in the art and which was never used by the patentee in his great business as a builder.

The courts today have in methods advanced little over the tribunal which held it a legal fact, against Gallileo, that the sun revolves around the earth every twenty-four hours because they could accept the evidence of their eyes to the truth of this phenomena. Mechanical truth is in fact commonly hidden and because it does not appear on the surface our courts commonly rob the man who from the scientific standpoint is ahead of his time. They reward the failure, penalyze the success and bring such discredit upon the United States patent by so doing that today no matter how thoroughly a grant has been contested in the Patent Office, it is looked upon as such a speculative title that it does not constitute a safe investment for the conservative man of means.

Catalogs Have Increased in Value

Manufacturers and sales managers ought to sit up and take notice now of the NATIONAL STANDARD CATALOG SIZE recommended by the National Association of Purchasing Agents.

The purchasing agents are now establishing standard files for the catalogs which will fit them, and "misfit" files for those which because of their awkwardness cannot be filed with the standard catalogs.

The Dodge Manufacturing Company, Mishawaka, Ind., has discovered that they have accumulated over eight hundred catalogs which accommodate themselves to the standard file. E. L. Ogden, of Boston, who is purchasing agent for twenty-three gas and electric companies, has gone one step further and keeps the standard file, which he says contains about six-hundred catalogs, in his own private office, while his misfit file is in an adjoining room.

It is important to all manufacturers and dealers that they have their catalogs in the files which are most constantly referred to. The fact that 7½x10⅝", the NATIONAL STANDARD CATALOG SIZE, accommodates itself to practically every industry accounts in a measure for its popularity. Manufacturers who have formerly issued catalogs in other sizes have found it awkward to discard their old plates when printing new catalogs, but now that the day has arrived when the purchasing agents, engineers, master mechanics and others are installing special standard files, the sales value of the catalog comes more than ever to the front in determining the matter of size.

Cutting Costs on Road Construction

By F. E. Miner*

It has been our experience that machinery is a big factor in cutting costs on concrete road construction. We have a contract for building six and three-quarter miles of concrete road, known as the Chicago-St. Louis Highway, running through Henry, Ill. It is 16′ wide, 7″ at the sides, 8″ at the center, and is being handled in exact accordance with the latest Standard Specifications of the Illinois Highway Department.

Hauling Six Loaded Trailers—Saving $7000

Where the machinery plays a big part is in the hauling, handling and storage of materials. The motive power consists of a Holt Caterpillar tractor as shown in the illustration. This is of 60 horse power and is used for pulling the road grader and also for hauling cement, sand and gravel. In dragging the road grader, it saves men as well as horses, because only one man is needed for the tractor.

This tractor will easily haul six loaded wagons containing 4 cubic yards each of sand and gravel—in other words, 24 cubic yards of material or from 32 to 35 tons. This means a big saving and we figure that in hauling alone, the tractor will save us $7,000 on this job. The cement is also transported on the job from the warehouse by means of tractor and trailers.

The economical handling and storing of sand and gravel from railroad cars is a feature which we have been able to work out very well on this work. The materials

Pulling the Road Grader

have to be hauled at an average of 2¾ miles from the railroad track. For this purpose of handling and storing the materials, we erected sand and stone bins.

These bins are the shape of an inverted pyramid and are 12 feet by 16 feet at the top. Each of them has a capacity of 32 cubic yards; one is used for the sand and the other for the gravel. The materials are taken from the freight cars by means of an automatic ¾ cubic yard clam shell bucket. After being placed in the bins, the materials are loaded into truck by gravity. These sand bins are designed so that two wagons can be loaded at one time, thereby loading a train of six wagons in approximately three minutes, which we think is making good time.

The bins cost $600 to erect and we figure will more than pay for themselves before the job is finished. The cost of unloading, handling and transportation of the sand and gravel is always more or less of a problem, and this method of solving it has proven very satisfactory with us.

*The Holm Page Co., Rockford, Ill.

Good Roads Foster Citizenship

(From The Breeders' Gazette of August 5, 1920)

"A few weeks ago a Gazette editor, traveling through the northern parts of Minnesota, Wisconsin and Michigan, while impressed by the excellence and extended mileage of the main highways, along which farm homes have been and are being established, was more deeply impressed by the isolation of farmers and their families who have 'settled' in districts where the roads are little more than trails through the woods and over cut-over lands. Many farm families, however, in other states are equally isolated, especially in the spring and sometimes at other seasons.

"Its famous roads, which endured for centuries, were foremost among the factors that produced the grandeur and glory of Roman civilization. Macaulay says that 'the Romans were like brothers in the brave days of old.' Why? Was it not because they circulated among and hence knew one another? What the best citizens said and did was common knowledge, disseminated by word of mouth. Customs, manners and social ideals were spread by example. Good roads aided in establishing and maintaining a fine nationalism, a high degree of culture, and an exalted sense of citizenship.

"Although we have schools, colleges, churches, railroads, waterway transportation, telegraph and telephone lines, newspapers, periodicals and books, there are thousands of alien, clannish and potentially good people in America who are practically untouched by any of these agencies of modern enlightenment. These human stocks are not breeding the kind of citizenship which we need now and shall need in the future. They are cut off from the major currents of American life and carried in personalities and words. If and when good roads for autos and motor freight traffic are built in the newer regions, which have an industrial or an agricultural future, the circulation and mixing of people will take place, and these contacts will improve all classes affected.

"The remark of an ancient sage that 'man's ignorance is his greatest handicap' is recalled by many observers of current events and conditions in this country. Thousands of people are ignorant—some viciously ignorant—because they have grown up in isolation, without mental training and the humanizing influences of modern social institutions. But most unenlightened, superstitious and unprogressive folk

are not enemies of light; they are instinctively hungry for knowledge and experience. Unfortunately, however, in a big, new country, sparsely populated, they live apart from most of the forces which train and sharpen intelligence, and exercise and develop those faculties of mind and heart which distinguish the cultivated man from his brother in darkness.

"Good roads are the highways upon which the agencies of popular enlightenment travel. They are the arteries through which fructifying streams flow into the economic and personal life of the people. Automobiles and motor trucks are more than mere pleasure and business inventions; they may and should be incalculably effective instruments for the improvement of citizenship. Every state governed by real statesmen, and inhabited by real Americans, is building and maintaining good roads, in which the interest of stockmen and farmers probably is more vital than that of any other class of people."

Build for the present and also for the future. Build once and for all and that is only accomplished by concrete, reinforced with steel fabric. There is no other solid and enduring way.

Sand and Gravel Producing in Michigan

Material Obtained From Both Pits and River

That the sand and gravel business in general is booming, and that this condition applies in particular to this industry in Michigan, is readily set forth by the activities of just one concern in that commonwealth.

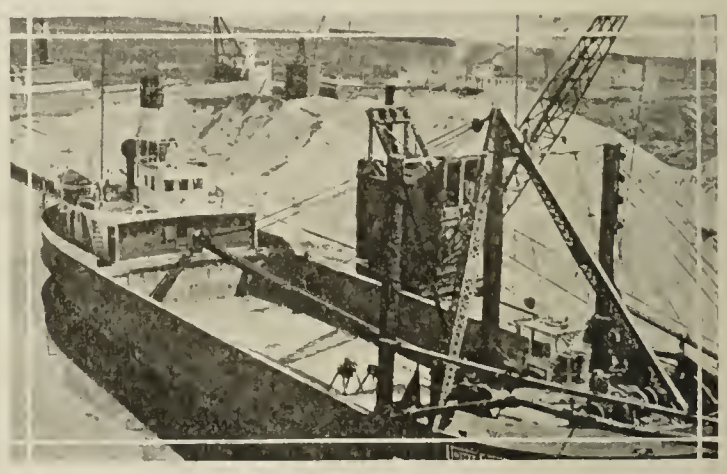
However, the concern of which we now write—the United Fuel and Supply Company of Detroit—is one of the largest sand and gravel producers in the country.

This company has in operation eight inland plants, having just recently completed one at New Hudson, Mich., and owns five river front docks and ten lake gravel boats of from 350 to 600 cu. yds. capacity each.

The New Hudson plant, which is the one recently completed, is in every way a modern and complete plant for sand and gravel producing.

At this plant the material is excavated with a dragline excavator operated from a structural steel mast 125 ft. high. This discharges to a large auxiliary storage pile over a field tunnel.

From this storage pile material passes through a series of duplex cut-off gates to the reclaiming con-



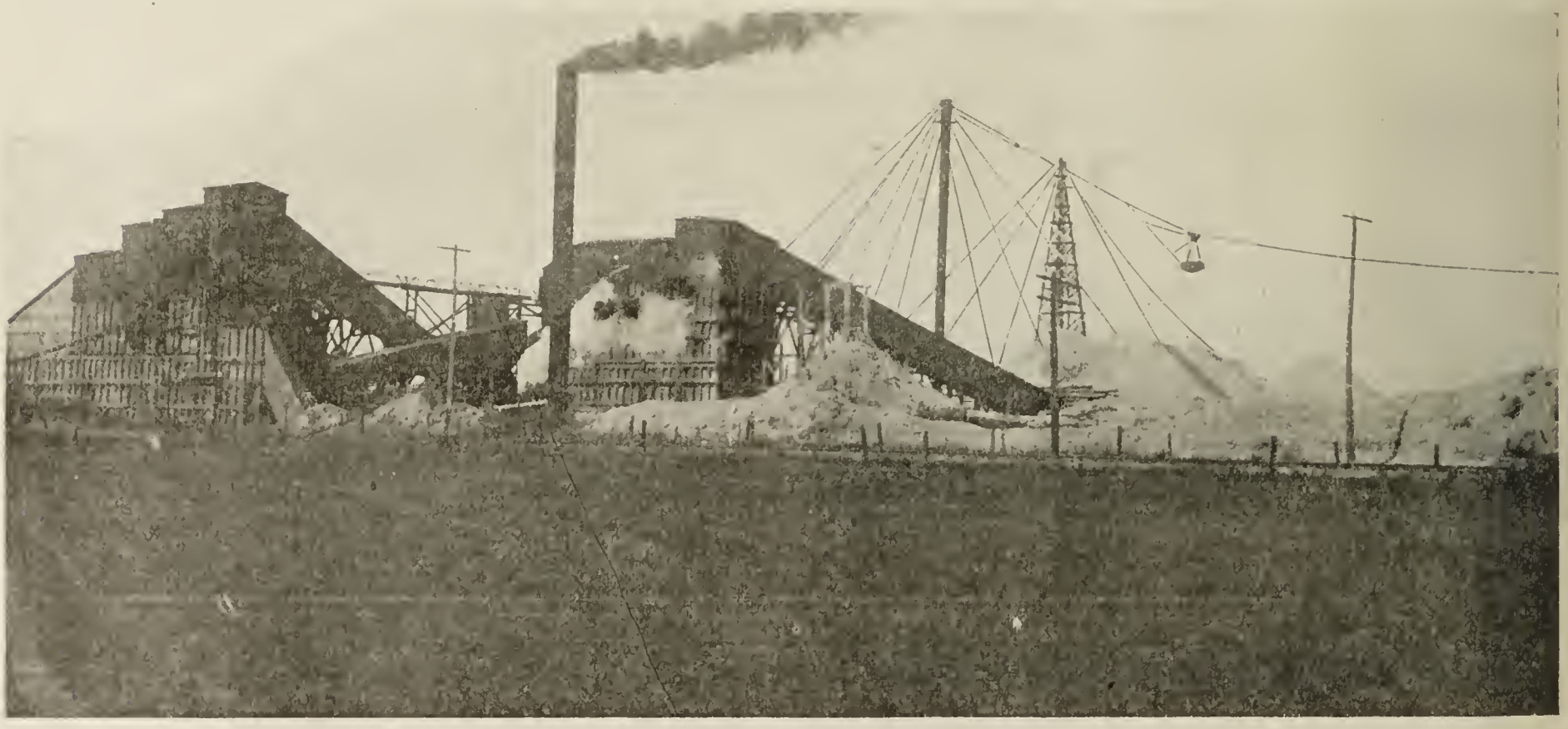
One of the Derrick Boats at Dock

veyor beneath. This conveyor carries the material to a large revolving screen, from which the over-size is passed to a crusher and then back to the reclaiming

A dock scene at River Range

conveyor. Material that passes this screen is carried by a belt conveyor to a set of washing and sizing screens.

Bin storage is provided for about 500 tons of washed material which can be discharged through gates into cars. Provision is also made for supplying concrete aggregate in properly mixed proportions by means



Sand and Gravel Hauling in Michigan

of nine duplex cut-off gates in the bottom of the finished bins. These gates feed to a belt conveyor which discharges into a mixing bin.

The operating power of this plant consists of two 200-h. p. boilers, one 250-h. p. steam engine for driving

Section of Dock and Stock Pile

the plant and one 100-h. p. hoisting engine for operating the drag-line.

The river boats before mentioned are of two classes. Some load material by means of derricks and clam-shell buckets, while others are equipped with two 10-in. centrifugal sand pumps. These last mentioned can only obtain material from a depth of about 30 ft., while the clam-shells can dig to a depth of 50 to 60 ft. At the docks material is either put in bins or on stock piles and a locomotive crane equipped with a 4-cu. yd. dipper is used for this purpose.

This large sand and gravel producing company is a large user of Hercules wire rope in both its land and marine activities.

In addition to its method of obtaining its material, the United Fuel and Supply Company operates a fleet of 60 large trucks and some 200 teams for distributing.

National Lime Association

Laurance H. Bart, the newly appointed manager of the Construction Department of the National Lime Association, Washington, D. C., graduated from the Ohio State University in civil engineering in 1910. He has had a wide engineering experience, including six years with the firm of Lupfer and Remick, consulting and contracting engineers of Buffalo, where his work was mostly on the New York State Barge Canal. This acquainted him with a variety of construction problems and operations. It comprised surveying, mapping, estimating and bidding, purchasing of supplies, designing of concrete work, testing of materials, and superintendence of operations. During these years his work included much public speaking before engineering societies, college audiences, and boards of trade.

Mr. Hart is available for consultation on any phase of the use of lime in building operations from plaster and brick work to stucco and concrete .

The Jeffrey Limestone Pulverizer

The large amount of road construction and repair work, and the demand for limestone for agricultural purposes, have opened up a new source of revenue for the stone crushing plants who are equipped with a pulverizer suitable for turning out the kinds of material required. The Jeffrey Swing Hammer Pulverizer, Type D, will therefore prove worthy of investigation in this connection.

General view of the screenings and washing plant at Oxford, Michigan

The Jeffrey pulverizer produces material one-fourth inch and under for top dressing or filler—an excellent binding material for water bound roads. This product is also used for the finer grade of concrete work. It is primarily designed and constructed for reducing limestone, shale, etc., and can readily reduce many other rocks and minerals to a powdered form, the reduction being more or less according to the speed and equipment. The Jeffrey Manufacturing Co. has issued Bulletin 147 M which fully describes and illustrates the pulverizer. A copy of the pamphlet may be obtained by writing to the main office of the company at 914 North Fourth street, Columbus, Ohio.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of Cement & Engineering News, published monthly at Chicago, Ill., for Oct. 1, 1920.

State of Illinois, } ss.
County of Cook }

Before me, a notary in and for the State and county aforesaid, personally appeared John F. Waldron, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Cement & Engineering News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Wm. Seafert, 22 Quincy St., Chicago, Ill.
Editor, Wm. Seafert, 22 Quincy St., Chicago, Ill.
Managing Editor, Wm. Seafert, 22 Quincy St., Chicago, Ill.
Business Manager, John F. Waldron, 22 Quincy St., Chicago, Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Wm. Seafert (sole owner), 22 Quincy St., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is .....(This information is required from daily publications only.)

JOHN F. WALDRON.

Sworn to and subscribed before me this 22nd day of September, 1920.

(Seal) FRANK W. McVICKER.

(My commission expires January, 1921.)

An Illinois Sand and Gravel Plant

Although the Peoria Washed Sand and Gravel Co., at Peoria, Ill., obtain their material at a point on the Illinois River about 17 miles from the plant, a steamboat, in conjunction with a fleet of 13 barges, sees to it that this distance causes no operating delays.

Material is obtained by a 1½-cu. yd. clam-shell dredge. which loads from three to four barges a day, each barge having a capacity of from 150 to 300 tons. The steamboat makes a round trip a day.

The steamboat and some of the barges

Upon arrival at the plant the barges are unloaded by a stiff-legged derrick which also operates a clam-shell bucket. This derrick has a 73-ft. boom which enables it to discharge its loads either into a receiving hopper or onto a reserve stock pile.

The receiving hopper feeds a conveying belt that passes underneath it as well as underneath an adjoining loading track, and discharges at the main structure. Material is then hoisted by a bucket elevator system and fed to the screens.

The screening apparatus is of their own design and is of the roller type. Rejected material is chuted to a gyratory crusher, while other material is elevated to the washing and grading department of the plant.

When material is ready for the market it is either chuted to loading bins or to storage piles. There are bins for loading both wagons and cars. The capacity of this plant is about 12 cars a day.

Power for operating crusher and screens, as well as for pumping water, is provided by a Westinghouse 75-h. p. electric motor. Other motors are also used. The derrick is operated by steam.

Relative Wear of Different Pavements

The Bureau of Public Roads is making a study of the relative wearing qualities of different types of pavements and tests have been about completed on a short section of pavement containing 49 different types subjected to the wear of a special truck equipped with five large cast-iron disk-like wheels. The relative wearing qualities of hard as compared with soft brick are brought out very distinctly in this test. The resistance to wear of various kinds of stone block sections is also shown up to good advantage. A chance to compare grout and asphalt fillers for both brick and stone block is furnished by this investigation. Likewise, the relative wearing qualities of concrete when mixed with various kinds of coarse aggregates is indicated.

Investigation of Subgrade Materials.

The investigation of subgrade materials started a few months ago with the cooperation of the District engineers and State engineers is proceeding at a very satisfactory rate. A number of samples have been received from various parts of the country and laboratory analyses of many of these samples are partially completed. The methods being used by the Division of Tests will shortly be published as a paper so that any other laboratories wishing to conduct similar investigations may have some guide as to the method of procedure being followed by the Bureau of Public Roads.

The stiff-legged derrick for unloading at the plant

The samples analyzed have been taken from parts of the roads that have failed very badly as well as from adjacent parts of the same roads that have withstood heavy traffic successfully. It is hoped that by a comparison of the laboratory results on these samples with the reported behavior of the road in service differences in the subgrade materials will become apparent so that we will be able to say what physical characteristics soils must possess to give them high bearing value.

The Manufacture of Cement at Bellevue, Mich.

The limestone deposits in the state of Michigan, which are suitable for cement making, lie in the form of a sort of basin. In the northern part of the state, the outcroppings are more evident. In the middle and southern portions the limestone lies mostly too deep to be available. There is a slight outcropping around Bellevue, about the only place in the southern part of the state where the deposit is workable. At the Burt Portland Cement Company's plant it comes practically to the surface and the overburden is hardly more than 4 inches to a foot in thickness, easily removed with scrapers. There is rock enough right around the plant for another fifty years at the present rate of operation, the company owning several hundred acres.

The rock as it is quarried contains some clay, but this is suitable for the mix and does not have to be removed. The rest of the clay, to further increase the alumina content, is dug from a pit four miles away and brought to the plant by two motor trucks, operating with trailers.

With two trucks (loaded) and two trailers, seventy tons of clay can be transported in five trips. Both trucks and trailers are equipped with steel tires.

In the quarry two steam shovels are operated, one 10-ton with 1½ yard dipper, and one 80-ton with 1¼ yard dipper.

Utilization of Waste Heat

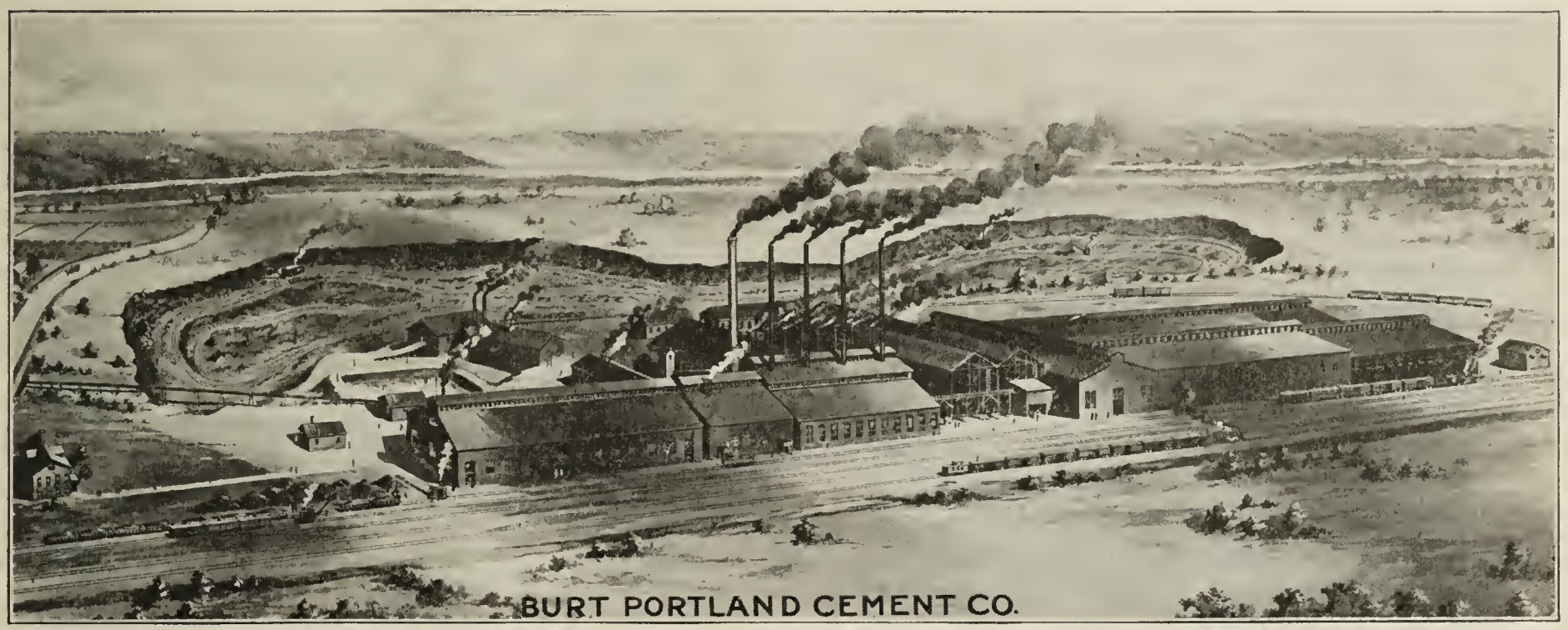
On a balcony in the kiln house are installed four 340-hp. water tube boilers which utilize the heat from the kilns, which would otherwise be wasted. In designing this installation no effort was made to make steam generating units out of the kilns, but simply to make steam from the heat which would pass to the stacks.

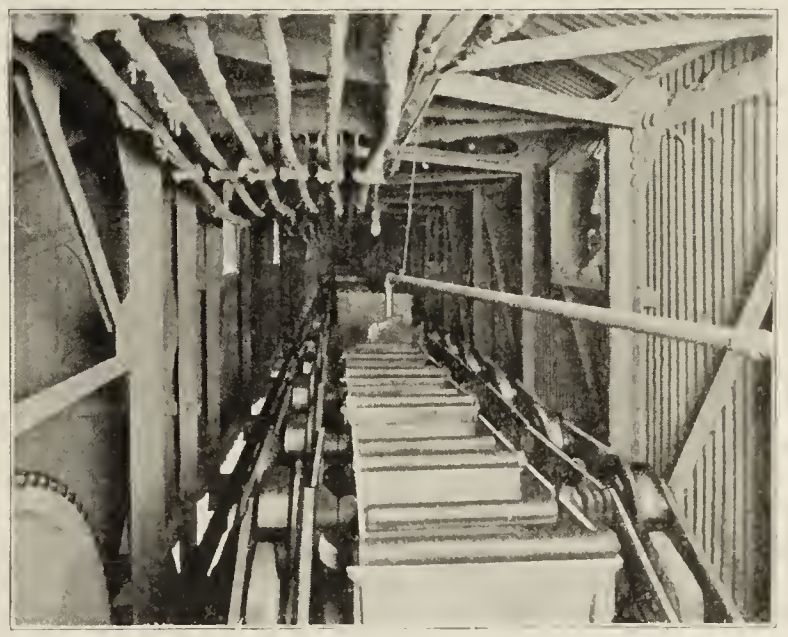
So well did the plan work out that 50 per cent of the power required for the operation of the plant is generated by these boilers.

The gases from two kilns are passed to each boiler through a gas duct which takes the place of the ordinary furnace. The steam is piped 250 feet to the power house. The regular boiler plant in the latter consists of five boilers of 340 hp. each, but it is seldom that more than two of them are in use at one time, although the reserve capacity is there, in case of emergency, to operate the whole plant.

The heat from the clinker pit is also utilized, by drawing the air from the kilns out of the pit by means of a fan, the kiln supply being thus pre-heated to a considerable degree.

Nearly ten years ago they were confronted with the problem of conveying red hot clinkers, discharged from the kilns, to a clinker storage building, a distance of about 200 feet. The clinkers were discharged from the kiln by gravity, which necessitated the building of a tunnel under the kiln room floor. The heat of this tunnel would always be extreme, as it was planned to handle the clinkers in red hot condition in which they were discharged from the kilns without putting them through a cooling process. Under these circumstances hand labor was impossible, as there could be no sustained human effort both because of the extreme heat in such a small area, and also on account of the nature of the material handled. Therefore the problem was reduced to a study of machinery which would permanently stand up under the stress of such exacting work—probably the hardest work in which a conveying system could be engaged.





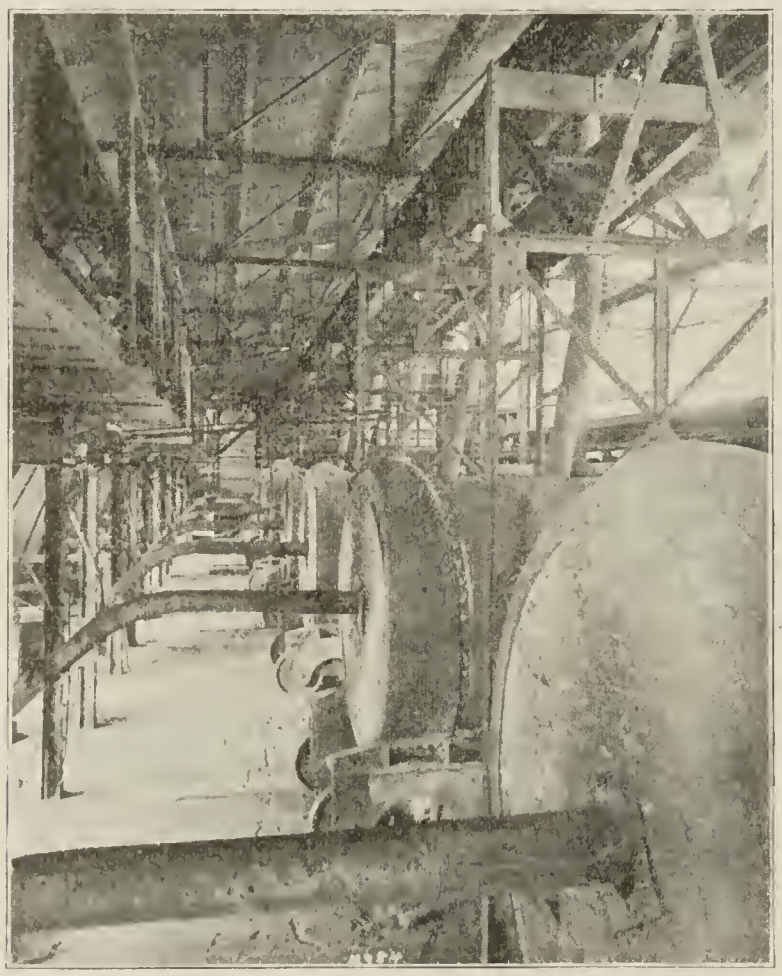
Buckets Passing Over Trips on the Upper Run of Conveying System

The Webster Mfg. Co., engineers tackled this problem in an endeavor to solve it to the complete satis-

faction of the purchaser. There were questions of weights, strain, heat resistance and kindred factors, to say nothing of the element of proper oiling under conditions of extreme heat, all of which was further involved when it became known that the conveyor was expected to perform a continuous service of 24 hours per day, including Sundays. So well did Webster engineers do their work that no repairs to the equipment have been necessary, even the wear has been so minute, that the take-up has never been changed, showing that the stretch has been very slight. It has been in continuous service since 1911, and after nearly ten years of exacting operation the owners say that it is one of the most satisfactory machines they have ever purchased—truly a tribute to the thoroughness and care with which Webster Equipment is designed and manufactured.

Record System

Like other cement plants, elaborate records are kept showing the hours each and every piece of equipment is in operation, the quantities of material passing at every stage of the process, and the exact combination of these materials. This, of course, is very closely tied up with the department of the chief chemist, C. H. Denham.



Kiln Room Showing Upper Run of Conveying System

In connection with the mill records, however, there are some features that indicate a closer analysis than is common in plants of this character.

For one thing, an exact record is kept of every shaft, gear, pulley, belt and chain in the plant, in easily accessible form. We found it interesting to foot up the exact quantities of belting and chain, for instance.

A plant of 2,000 barrels per day cannot be considered large, but it developed that, for machinery drive alone, almost exactly a mile of belting is required, ranging from 2 to 18 inches in width. Add to this the conveyor belts, and we arrive at the total of 6,771 feet.

Much of the drive is by manganese steel chain.

Close record is kept of the life of belts, gears, etc., the repairs necessary, and prices. These records are all kept in card form.

Repairs to Plant Equipment

A machine shop with more than ordinarily complete equipment is a feature of the plant. It contains lathes, a planer, drill presses, hacksaws, emery wheels, bolt machine, oxy-acetylene welding equipment, etc.

All ordinary repairs are made in this shop and spare parts for machinery are constantly being made and put in stock.

A little wrinkle to facilitate repair work has been instituted, in the form of blue print diagrams of the complete driving equipment of each department, which are tacked up in prominent places. Every shaft, gear, pulley, motor, chain and belt in the department is indicated and numbered on the diagram. This greatly facilitates matters when an order comes through to make repairs or replacements on any part of the equipment. By a glance at the diagram the machinist can determine the exact location of the part to be repaired and go to it at once. This would not be possible in all the labyrinth of belts, chains and shafts without some kind of a guide.

Conveyor in Tunnel Under Kiln Room Floor. The Discharge of Hot Clinkers is Clearly Shown

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Electric Hoists

The revised edition of catalog No. 380 is now off the press and available for distribution. This 96 page book covers the Link-Belt line of standardized monorail electric hoists as well as overhead electric traveling cranes in capacities of ½ to 3 tons inclusive. It completely describes these machines—giving tables of weights, clearance dimensions and speeds, and is copiously illustrated.

The numerous photographs of machines in operation indicate that foundries, machine shops and factories of every description are fast coming to a greater realization of the need for installing labor-saving, cost-reducing, production-increasing equipment of this character.

Every architect, consulting engineer, railroad master mechanic, foundry superintendent and factory manager or engineer will be interested in this useful book. Copies can be had by addressing Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill., or any branch office of the company.

Quarry Stripping With a Revolving Shovel

By H. A. McPolin, The Dolomite Products Company

It seems strange that with all our progress in the art and science of quarry management, that the old system of stripping by hand and team should have remained unchanged for so long. This old rule-of-thumb method was difficult to discard, and continued —like a shaky inheritance—with our company until a few years ago.

How this came about is a story—romantic and economic—briefly this: One hot day—No, not once upon a time—the president of the company, the late Mr. H. P. Eells, Sr., was making his usual trip to the plant; he saw the men and the teams sweltering under a blazing sun. The teams and teamsters that were waiting to get wagons loaded were endeavoring to keep cool and swat the busy flies. One of the teamsters was the actual prototype of the now famous Fatty Arbuckle.

95-C Bucyrus Steam Shovel Loading Rock

The incident made such an irresistible appeal to Mr. Eells that he at once suggested to the then Superintendent Mr. Geo. W. Patnoe, the desirability of procuring a small revolving shovel to eliminate the conditions he observed.

This radical improvement brought the usual irresponsible effrontery from hand-made critics.

An 18-B Bucyrus was installed despite the critics. Seven years have come and gone, the big War has

Big Blast in quarry of Dolomite Products Company. What 4300 pounds of dynamite can do.

been fought. Kings and Princes have passed away. New maps have been charted, but the 18-B goes on.

The value of the investment has increased. The wisdom of supplanting the old method vindicated.

Today the upkeep of the shovel is only nominal. We have stripped 450,000 yards in the seven years. The repairs have been slight, outside of a new boiler, but this was due to the injurious effect water with a limestone deposit has upon all boilers.

The benefits from using a shovel of this type for stripping are obvious:

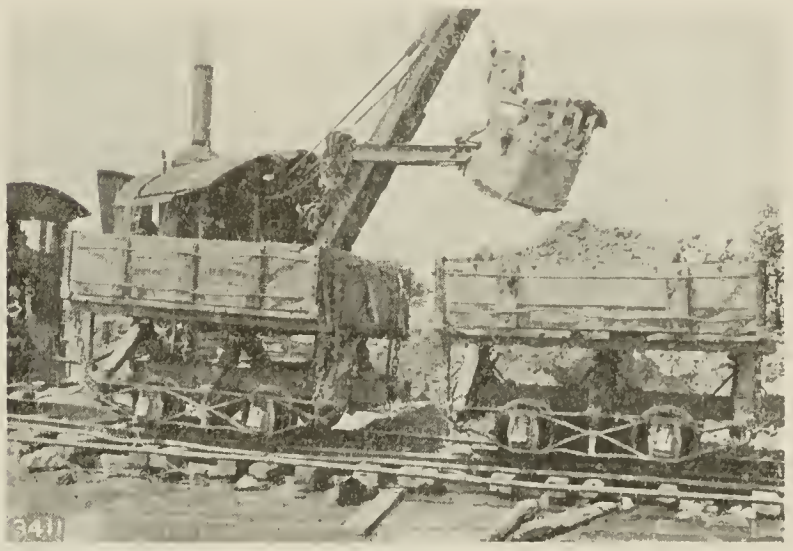
First: The great saving of man power.

Second: The rapid and efficient way the work is done.

Comparative Costs

The old method required one foreman, 25 men and 5 teams. Under the present wage scale the cost would approximately be:

25 men at $4.00 per day	$100.00
1 foreman at $5.00 per day	5.00
5 teams at $6.50 per day	32.50
A daily cost of	$137.50



18-Bucyrus Stripping Quarry for Dolomite Products Company, Maple Grove, Ohio

The present rate for handling the same quantity of stripping:

1 Engineer	$ 6.50
5 Men	20.00
1 Ton Coal	5.00
Waste, Oil, etc.	1.50
Allow for Depreciation	2.00
	$ 35.00
Net saving per working day	$102.50

The depreciation of shovel, etc. about equals the loss due to hand shovels broken, etc., when used by a gang of 25 men.

The following factors should be considered too:

Efficient performance.

Reliability and adaptability.

Moderate upkeep.

Necessary problems to be considered when endeavoring to increase the market for stone and meet high priced labor.

Metalforms, New Booklet

The Metal Forms Corporation, 1436 Booth St., Milwaukee, Wis., are sending to interested parties a folder introducing metalforms, which are interlocking steel forms used in monolithic concrete construction. It contains a complete description, with illustrations, as to uses and how these forms eliminate the use of wood forms, which hammer down the contractor's concrete profits.

Be Sure of Your Concrete Before Placing in Forms

Simple Job Tests By H. W. ELDRIDGE*

Concrete is an indestructible, economical and fireproof material for buildings and engineering works. It differs from most other building materials such as steel, brick, terra cotta, tile, cast iron, etc. These materials are manufactured under standard factory and mill conditions. The processes of manufacture are standardized to such an extent that very few changes are necessary and these process changes are made only at such times as proven betterment is secured. Manufactured in ideal mills, factories and foundries by men of many years' experience, these materials are standard in every way when delivered for use. Therefore, the contractor is enabled to make use of them and feel confident of good results, knowing that the average quality will be satisfactory Mother Nature is responsible for the manufacture of timber and it is conceded by all that the process of making it ready for use is standard. A contractor knows that timber of the different varieties is capable of taking specific loads and it is only necessary to inspect for a few inferior qualities.

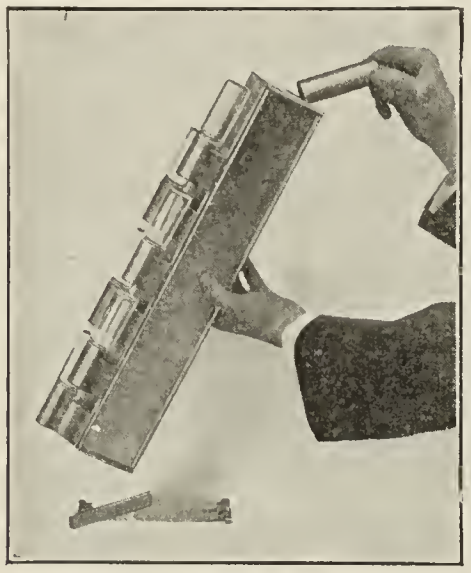


Figure 1
Putting in the Sand

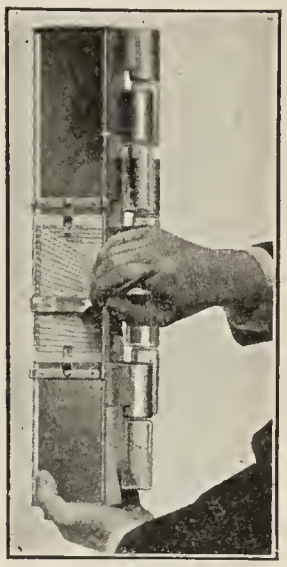


Figure 4

Figure 2
Agitating with Water to Separate into Grades

Concrete—The Exception

Concrete is not factory made nor is the quality guaranteed by nature. Only one of the ingredients of concrete is factory made and guaranteed by tests. This is the Portland Cement. The manufacturers of Portland Cement guarantee that the product will meet the standard specifications of the American Society for Testing Materials.

If a contractor purchases the cement manufactured by a reputable company, it is a foregone conclusion that there will be no trouble experienced with the concrete, as far as the quality of cement is concerned. However, the sand, pebbles, crushed stone and water require careful examination and test. These are the materials which are not factory made and have not been guaranteed as to quality. It is now deemed good engineering practice to make a laboratory test of sand, pebbles and crushed stone for concrete work. By all means the laboratory tests should be made. Are these tests sufficient? In the case of the sand, the material varies in the bank and the result is that when delivered on the job does not run uniform. Therefore, the samples which are submitted for laboratory test may not be representative of the sand received at the job. This same condition is true of the pebbles, and all those having experience with stone quarries realize that the quality of stone found in the ledge varies in hardness, toughness and other qualities to a very marked degree. Therefore, it is absolutely necessary for the contractor to make the simple field tests to be certain that the material delivered on the job will make good concrete, and also to make certain tests of the concrete on the job to know that the materials have been properly proportioned and mixed so that first class concrete will result. This article has been written to emphasize the importance of these job tests and to explain the details.

It has been a sad awakening for many contractors on concrete work to be ordered by the engineer to tear out part of their work which has not come up to the standard. The contractor is naturally honest and above all else wants the quality of his finished work to be of unquestioned stability, because therein lies the key to his reputation. He attacks the work in all good faith and every move which is made on the job is, as he thinks, "according to Hoyle."

Many contracts provide that the contractor shall be responsible for the character of the finished work even though the owner has been represented throughout the length of the job. In these cases it is strictly up to him and he must make good. Where the provisions of the contract place the entire responsibility on the engineer then almost every contractor will assume this responsibility and replace any inferior work. This is done because he wants to have the work right, whether he is legally responsible or not. Nevertheless, this is costly to the contractor. Would it not be far better if the contractor would do a little testing on the job and be sure of the quality of the component parts of the concrete

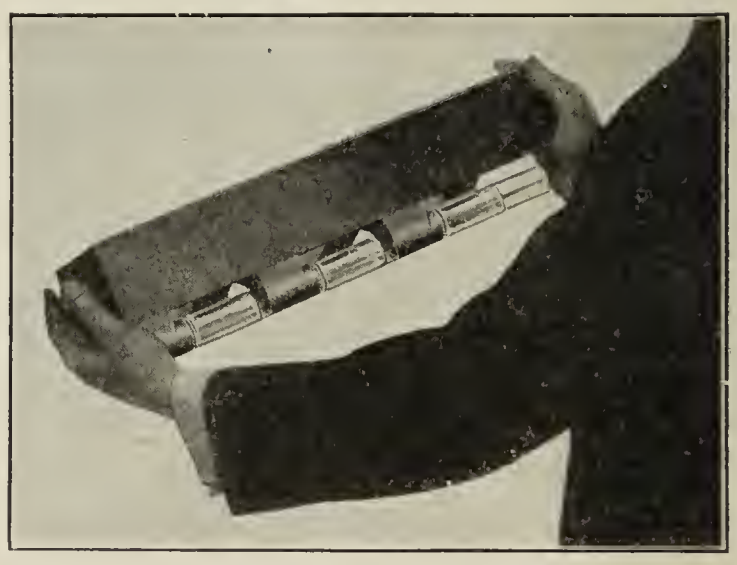


Figure 3
Collecting Graded Sands from Screens

*District Engineer and Manager, Cement Gun Co., Inc., New York City.

and the density and consistency at the time of placing? This would be the common sense, good business method. Watch the quality of sand, pebbles and crushed stone, and pay strict attention to the amount of mixing water used and the result is bound to be "concrete" worthy of the name.

The tests made on the job can be simplified to such a degree that it is possible for a foreman with ordinary intelligence to secure results showing the quality of the sand as it is delivered, and regulate the amount of water used so that he knows at all times a superior quality of concrete is being produced.

Sand

First, test sand for grading. This is called the granulometric or sieve analysis. This test can be made by the use of a set of standard sieves, or a more simple way —and one with which the foreman can obtain better results—is the Universal Sand Tester. This is a small instrument which determines grading of the sand and indicates the cleanness. A graded series of standard mesh screens (Nos. 6, 10, 20, 35 and 65) in a water-tight casing; a series of glass vials communicating with the screens; means for holding and making a graphical record of tests, comprise the essentials of the apparatus. Wet screening is simpler and more efficient than dry screening.

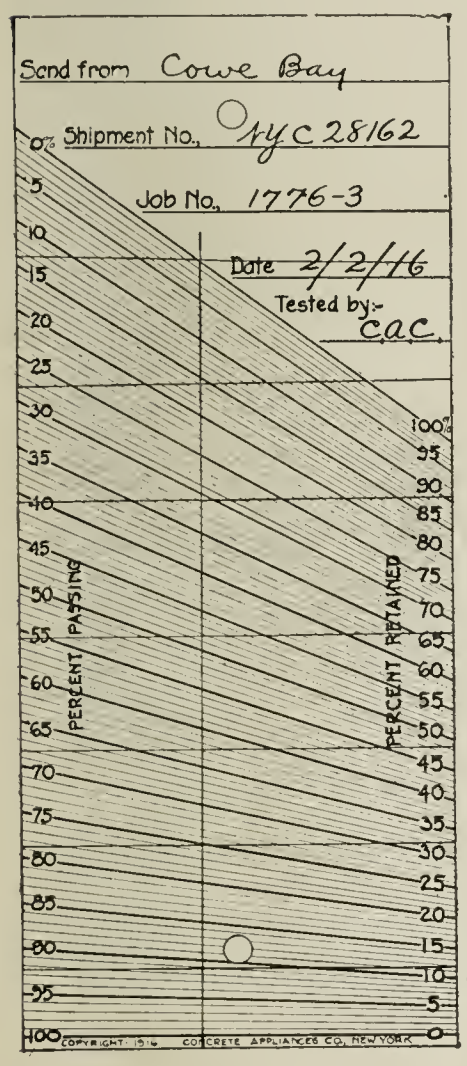


Figure 5
Record Sheet No. 1 for Marking Results of Sand Tests, Showing a Record of a Test Marked Thereon.

Fig. 1 shows the first operation. A small metal measure is filled with the sand and emptied into the casing through an opening at one end. Through the same opening water is poured until it shows above the first screen.

Fig. 2 shows the instrument held between the hands, vial-side uppermost, a reciprocating motion given, impulsing towards the downward end of the stroke. This causes separation of sand particles by wave action of the water.

Fig. 3 shows the instrument vial-side down. Shake gently to wash materials from screens.

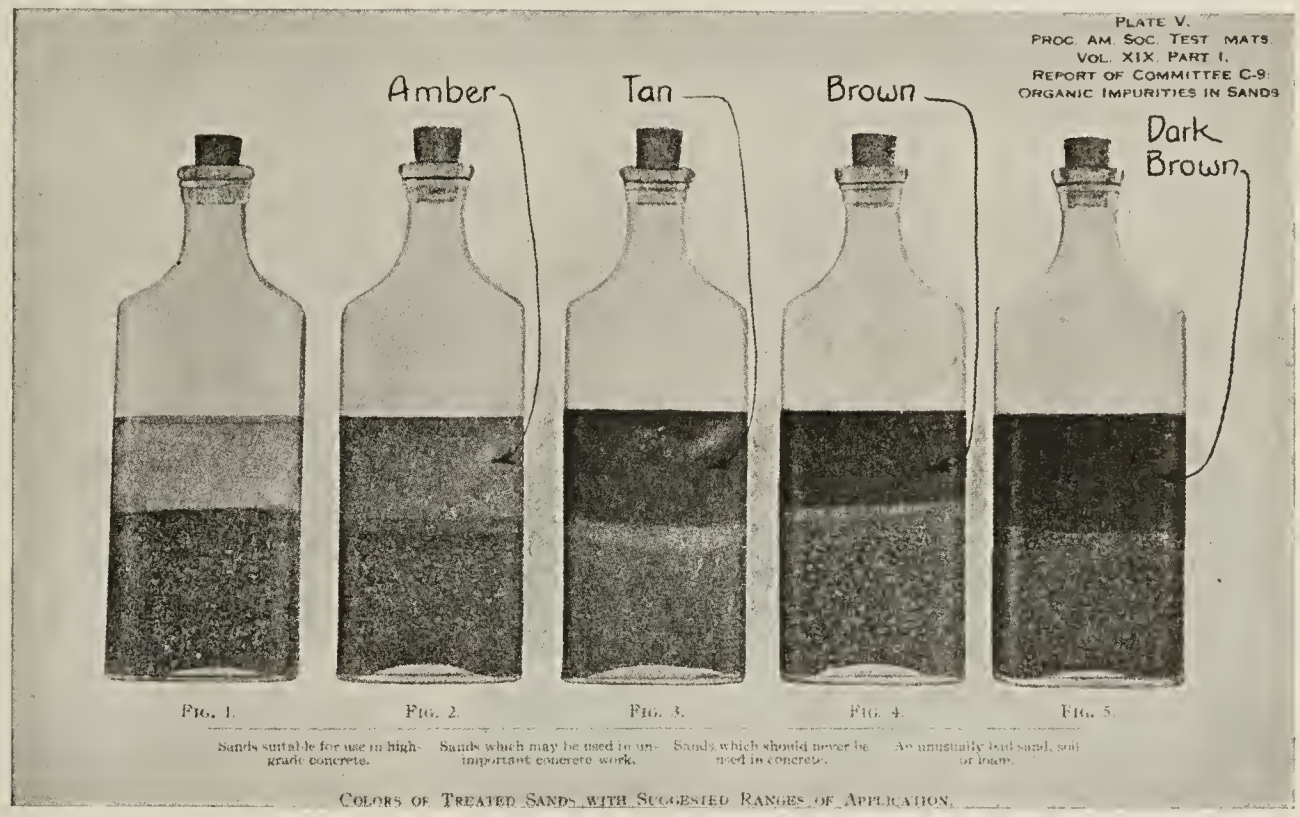
Fig. 4 shows instrument turned into vertical position, when materials will flow into glass vials. Shake gently to insure deposit of all materials.

Fig. 5 shows record sheet put on plate, and by successive placing of index at top of sand in successive vials, drawing pencil line along index across record sheet each time, and placing this pencil line successively level with bottom of next succeeding vial, form the record sheet either singly, or in duplicate or triplicate, as may be desired.

This is a method which can be successfully used on the job and is the method which does not require the services of a testing engineer:

Clay or Loam

The test for loam or dirt can be made by placing some of the sand in a bottle partly filled with water and shaking well. The loam settles on top of the sand and a very good idea can be obtained as to the percentage of loam content. The clay and loam content should not be in excess of 5%. This percentage can be roughly measured by the use of an ordinary carpenter's rule. Measure the number of inches of sand and the number of inches of



loam. Divide the loam by the sand and this gives the percentage of clay or loam content.

Organic Impurities

The third test on the sand should be for organic impurities. This test can easily be made as shown by the following extracts from "Abrams-Harder Field Test for Organic Impurities in Sands" (as published in the proceedings of the American Society for Testing Materials):

"Method for Field Test. The field test consists of shaking the sand thoroughly in a dilute solution of sodium hydroxide (NaOH) and observing the resultant color after the mixture has been allowed to stand for a few hours. Fill a 12-oz. graduated prescription bottle to the 4½ oz. mark with the sand to be tested. Add a 3 per cent solution of sodium hydroxide until the volume of the sand and solution, after shaking, amounts to 7 oz. Shake thoroughly and let stand for 24 hours. Observe the color of the clear liquid above the sand. A good idea of the quality of the sand can be formed earlier than 24 hours, although this period is believed to give best results.

If the solution resulting from this treatment is colorless, or has a light yellowish color, the sand may be considered satisfactory insofar as organic impurities are concerned. On the other hand, if a dark-colored solution of a color deeper than that indicated by Fig. 2 (Page 28)

is produced, the sand should not be used in high grade concrete such as that required in roads and pavements, or in building construction. Sands showing color as dark as that in Fig. 3 may be used in unimportant concrete work. Sands showing colors darker than that in Fig. 3 should never be used for concrete. Fig. 5 represents the

Figure 6 U. S. Shipping Board Slump Test

color of the solution obtained with an unusually dirty sand or from a sample of soil high in loam. A small quantity of material of this kind would make a sand unsuitable for use in concrete.

"*Apparatus.* The following list includes sufficient apparatus for making five field tests at a time:

5 12-oz. graduated prescription bottles;

Figure 7
The "Slump" Test as used by Windes & Marsh
Winnetka, Ill.

Stock of 3 per cent solution of sodium hydroxide (dissolve 1 oz. of sodium hydroxide in enough water to make 32 oz.).

"*Conclusions.*—Experience and tests have shown that it is the presence of organic impurities of a humus nature that is responsible for most defective sands. The colorimetric test furnishes a simple and inexpensive method of detecting the presence of such impurities. The test made in the manner described above will be found useful."

The Slump Test

It has been shown by tests that the amount of water used for mixing concrete has a great influence on the ultimate strength of the concrete. Too much water produces a low strength concrete and it is surprising to note that a slight variation in water content radically effects the strength. For example, when using 5¾ gallons of mixing water to each sack of cement the 28 day compressive strength was 2700 lb. per sq. in., and when using 7 gallons of water to each sack of cement the 28 day compressive strength was only 1950 lb. per sq. in. Increase in water content weakens the concrete. 15 gallons of water to each sack gives a 28-day strength of only 200 lb. per sq. in. Therefore, the amount of water should be carefully regulated. Mechanical concrete mixers are provided with batch water tanks. This makes it possible to supply the same amount of water for each batch of concrete. In practice it has been found difficult to produce concrete of uniform consistency in this way for the reason that the moisture content in the aggregates varies. A more practical method has been developed and is known as the "Slump test." This method is shown in Figs. 6 and 7. The apparatus is used to measure the consistency and indicates the proper amount of mixing water to be used. The method consists of filling a 6" x 12" cylinder with concrete. The cylinder is raised vertically and the amount of slump noted.

The apparatus in Fig. 7 was used on concrete road work and a slump of 4" for hand finished concrete and 2" for machine finished concrete is allowable.

Fig. 6 shows the slump test apparatus as developed by the U. S. Shipping Board, used on concrete ship construction. The allowable slump for this is 9". This 9" slump means that the concrete has lowered from 12" to 3" and the height of concrete after test should be 3". The wooden frame and windlass make it possible to raise the metal cylinder absolutely vertical and at a constant rate of speed.

This is a simple apparatus and can be operated by any handy man on the job. The proper consistency varies for each type of concrete construction as illustrated. However, when the proper consistency is determined for the specific job, this can be made uniform for the entire job.

Here is a direct message to you which may save you a great deal of money and result in much satisfaction.

Make all of these simple tests on your work. Know your sand and pebbles before mixing the concrete, and know the amount of water used after mixing.

If this is done the concrete can be placed and you can rest free from worry, knowing that there will be no "come back."

Link-Belt Roller Chain

The use of Link-Belt Roller Chain as a means of Power Transmission has been growing so rapidly that the Link-Belt Company has for some time back felt it would be desirable to publish an Engineering Data Book on the subject. Their new 78-page book No. 257 shows photographs of Roller Chain Drives operating motor trucks, tractors, cotton gins, industrial locomotives and other equipment, but is more than an ordinary catalog.

It is a hand book of exceptional value to every power transmission engineer and contains tables from which almost anyone can select the proper size of chain and sprocket wheels to result in the best driving arrangement.

Handling Materials With Few Men

By E. E. Neuviller*
Passaic, N. J.

Every construction contractor is putting forth his best efforts to develop cheaper methods for handling cement, sand, gravel, crushed stone and the many other materials used for building. It is no longer a case of saving labor but a "substitution" for labor. It has always been interesting and profitable to make use of machinery to save labor. It is now impossible to obtain a sufficient number of laborers to go ahead with the work, and therefore it is imperative that machinery be installed.

Some of the leading contractors in this country are

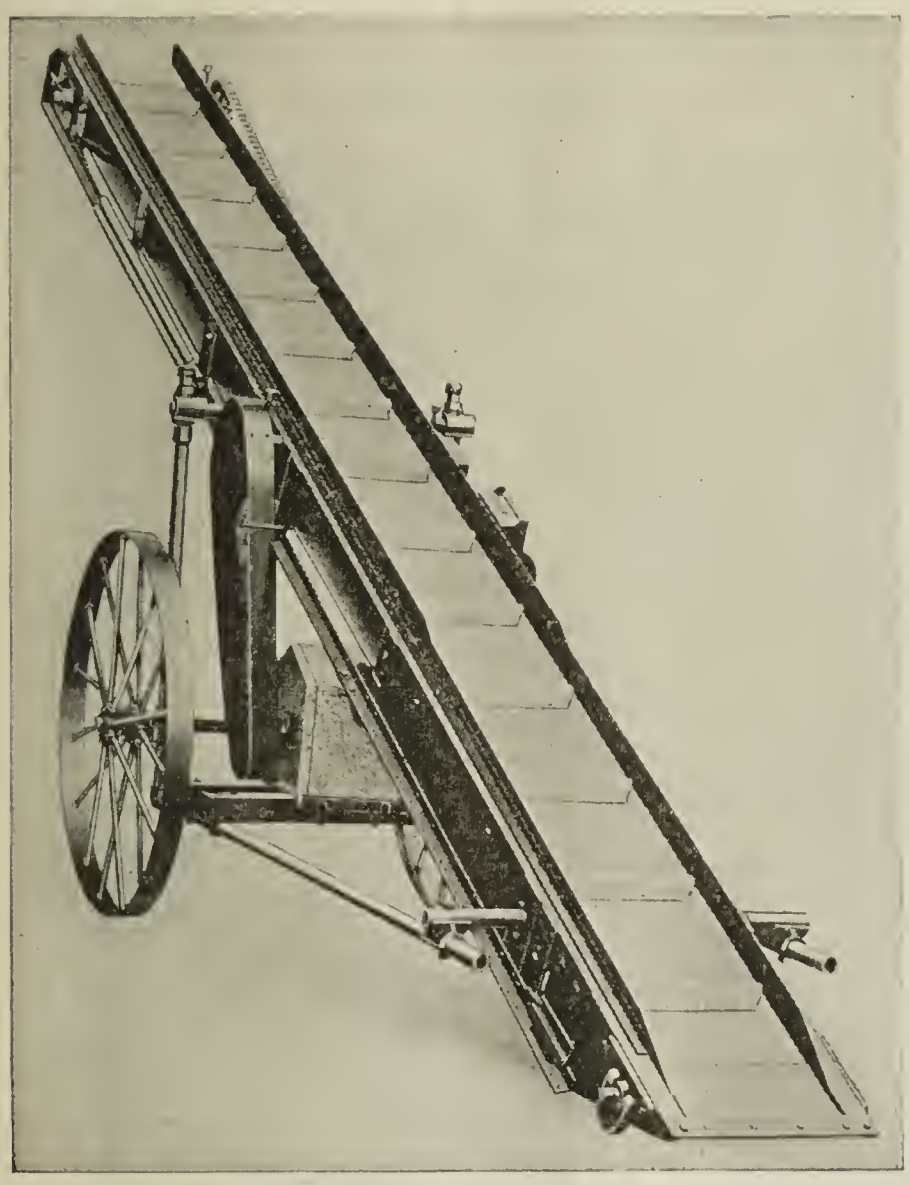


Figure 1
The Portable Scoop Conveyor

handling materials with a scoop conveyor and claim that it is a great labor saver (only about one-tenth as many men being needed).

The most distinctive feature of this machine is the scoop on the feeding end, which can be pushed or completely buried into the material to be conveyed. This makes it possible to simply scrape the material on the carrying belt, instead of lifting it up by shovelfuls into the feeding hoppers of ordinary conveyors.

The money savings resulting from the use of a scoop conveyor are due, first, to the saving in labor; second, to the speed at which material is conveyed. In comparison with handling material by hand, one or two men with a conveyor will do the same work as from four to twelve men without, depending upon conditions. The conveyor will load trucks in one-fourth to one-sixth the time required by men shovelling. It often enables one truck to do the work of two trucks and of getting two days' work done in one day.

In unloading hopper bottom cars, the conveyor can be used without providing a pit under the track. This saves the construction of a track hopper and makes it possible to unload cars at any point along the track. To unload cars it is only necessary to place the feed end of the conveyor near the car hopper and then drop the door. The belt carries the material away as fast as it flows through the hopper opening.

In addition to the labor saved in unloading cars, the conveyor saves car demurrage as it permits of unloading cars in a few hours.

One man and a conveyor under ideal conditions can unload a fifty ton car in one hour. Under average conditions, it requires about two and one-half hours, depending on the style of hopper bottom car and the natural flow of the material to the discharge doors.

Storage capacity is another factor of saving attributed to this machine, as it increases the available capacity of a shed or yard space by enabling the men to pile higher.

The carrying capacity of the conveyor, based on handling coal, sand, or similar material, is one ton per minute, provided a sufficient amount of coal is maintained at the receiving end of the machine. If the storage pile is of sufficient height, one man can easily feed one ton in one and a half minutes, or if the pile is low, he may require from two to four minutes. Where speed is required, two men may be provided for feeding.

Large size coal, coke, crushed stone, etc., fed by one man, require from three to six minutes for one ton, or half that time with two men.

Construction

As may be seen from Figure 1, the conveyor is strongly constructed, light in weight, compact, and portable. The steel frame holding the rollers and conveying belt is mounted on the wheels so that the balance is perfect. One man, by inserting the pipe handles into the ends of the horizontal members, can easily lift and move the machine around. The total weight of a 12-inch by 20-foot size machine with motor is about 1,100 lbs.

The machines are equipped with either electric or gasoline engine as desired. The motor or engine is mounted under the frame on the wheel truck, and transmits power to the conveyor by means of a chain and sprocket connection to a shaft extending beneath the conveyor. From

A Conveyor for Excavating, or Hauling Sand and Gravel

a sprocket on the other end of this shaft, the power in turn is transmitted to the driving sprocket, located at the upper end of the conveyor.

The head, tail and counter shaft bearings are adjustable, self-aligning, bronze graphite bearings.

*Portable Machinery Company.

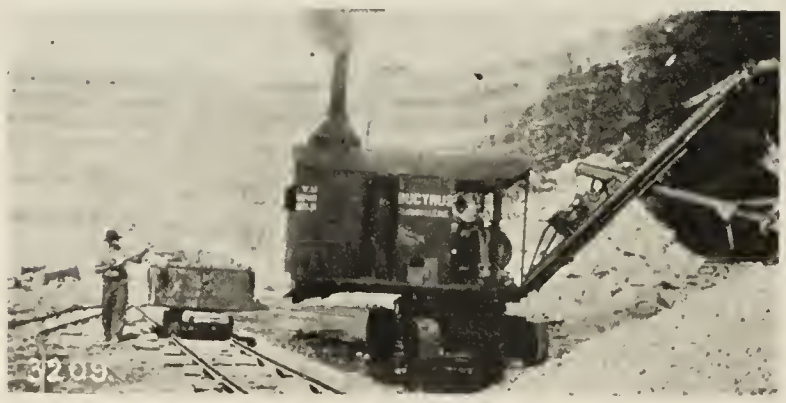
Roller chain and cut teeth sprockets are used. The belt supporting rollers are made of hardwood fitted with chemically treated oil-less bearings, and are spaced 7 inches apart, center to center.

The conveying belt is of high grade heavy duck and rubber construction fitted with either high arched rubber and duck carrying flight as shown in the machine, illustration 1, or with low cross strips, depending on the kind of material to be conveyed. These transverse cleats are provided to prevent the material from slipping back down the incline.

The conveyor is made in three different lengths, 16 feet, 20 feet, and 24 feet. The width of the conveying belt on any of these sizes may be either 12 inches or 16 inches wide as desired. Size 16 feet is elevated to a total height from the ground of from 4 to 6 feet; the 20-foot size may be adjusted from any height from 6 to 9 feet and the 24-foot size may be adjusted for any height from 9 to 12 feet.

Steam Shovel Lowered Into Quarry

The photographs on this page show how a 14-B Bucyrus shovel, owned by the Wauwatosa Stone Co. of Milwaukee, Wis., was lowered into their quarry at Wauwatosa, a distance of about 75 feet. The base of the shovel was lowered first and placed in position, ready for the revolving frame. The revolving frame was then placed in position under the sheer legs, the ventilator removed, and the hoisting hook lowered through it. The hitch was taken under the frame of the shovel and up to the hook which was inside the house. The revolving frame was then hoisted off the ground, with the assistance of two husky mules, and the guy wires on the sheer legs were let out. This allowed the sheer legs to lean forward, so that the revolving frame cleared the wall of the quarry on the way down. The weight of the revolving frame is approximately 19,800 lbs., and the weight of the base is approximately 11,800 lbs. The time required for erecting sheer legs, getting tackle ready and lowering the shovel, was about two days.



Gutta Percha & Rubber Mfg. Co. Enlarges Plant as a Result of Increased Business

Increased volume of business is responsible for an expansion of plant and equipment by the Gutta Percha and Rubber Mfg. Co. of New York. The present completed expansion consists of a new plant in Farmingdale, L. I., to be used as a rubber reclaiming station. This plant, which is supplied with entirely new equipment throughout, is now in operation and employs nearly 300 men.

In addition to this plant, the company is increasing its equipment for weaving cotton jackets for all kinds of hose, from the small garden hose to the large steam and fire hose. This expansion, also, is made necessary by increased business.

Several varieties of belting and hose are manufactured by this company. The belts include those made specially for cement, lime, gravel, sand and crushed stone plants, for ordinary transmission purposes and for axle-lighting purposes on steam railway cars.

The hose, as mentioned, also is produced for various special purposes. A sample of acid-resisting fire hose sold in 1897 was returned with a repeat order to the company recently. The old hose had been in service continuously at a large oil plant in Indiana.

During its period of service it had come in contact frequently with acid sludge in the paraffin plant and had been used considerably for its legitimate purpose, including service at several fires. After being returned it was still flexible and in good shape, and showed no leaks or defects when subjected to a 200-lb. water pressure.

New Texas Crushed Stone Quarry

Equipped with Modern Machinery of the Latest Improved Type

Wichita Falls, Texas, capital is developing a great industry, that of crushed stone for construction work and for road building and street paving, at Chico in Wise county, Texas. Seeing the need for crushed stone in Wichita Falls a little more than a year ago a group of Wichita Falls men set about to fill this need. After many surveys and investigations and tests they took a lease on a tract of 360 acres comprising an almost solid hill of a very fine quality of stone and organized the Lone Star Stone Company with a capital of $200,000.

A large sum of money was spent in installing machinery and in opening up the quarry and a few weeks ago the delivery of crushed stone was begun by the company. Officers of the company had expected a good demand for their product but they were unprepared to meet the extraordinary demand that poured in upon them. This demand comes from many sections and appears only to have started as a tremendous road building and paving campaign is just getting under way.

In order to provide capital for further expansion of the plant to enable it to more adequately meet the demands being made upon it, at a meeting held at Chico last week it was decided to increase the capital of the company from $200,000 to $300,000.

The 95-ton Bucyrus Steam Shovel Loading Cars in the Quarry of the Lone Star Stone Company

Inexhaustible Supply

The company has a practically inexhaustible supply of stone on its lease. It is estimated that in one hill alone there is 20,000,000 cubic yards of stone.

The stone has been examined by experts from Austin and found to be fine material for paving. The company has two blast hole drills that drill five and one-half inch holes. It will be some time before they reach the crest of the hill that they are working on now. At the present time they have to drill holes about 44 feet deep before placing the charge for a large shot. Forty holes are dug on the hill side and then filled with dynamite, capped with mud, the string of holes are then connected with an electric battery and are all shot at once. When the crest of the hill is reached it will require holes about 55 feet deep.

Following the large shot the rock is picked up by a 95-ton Bucyrus steam shovel and loaded on a train of dump cars and then run to the plant only a short distance away. The blast does not always break up the rocks in small enough pieces for use and they are then broken up further by what is called "dobying." This is done by placing a stick or part of a stick of dynamite encased with mud against the rock that is to be broken and then set off by fuse.

Large Steam Shovel

The large Bucyrus steam shovel has a three and one-half yard dipper and is capable of lifting four and one-half tons. It is one of ten shovels that were made for the government and shipped to the Panama Canal zone some time ago, but were not put into use and the local company feels jubilant over being able to purchase one of them. It can load a train of five dump cars every fifteen minutes. One trainload of rock will make over one carload of crushed stone.

From the quarry the train is taken to the plant with a Vulcan locomotive as the motive power, of which the company has two; here it is dumped into a large hole at the bottom of which is a large No. 13 Gyratory crusher. This crusher revolves slowly and at the same time has horizontal movement that crushes the stone against the sides of the cone-shaped pit. From this crusher the stone falls into another pit and is caught here by a large conveyor and carried to a scalping screen in the top of the building. The screen is constructed with holes and stones under three-inch sieve through it into bins. Stones that are from 3 to 5 inches in width are then carried to smaller crushers where they are reduced to sizes required by the public. They are then carried to a large screen arranged with sets of holes so that eight different sizes of stone can be had. There are eight large bins ready to receive its particular size stones, each bin capable of holding 75 tons. These bins are high about the tracks and are

so constructed that they all lead to one large chute down into the gondolas or other cars. A car can be loaded in five minutes.

At times when it is hard to get the gondolas, box cars have to be used. For this purpose they have a machine called the Ottumwa box carloader, made in Ottumwa, Ia., and is so made that the stone is conveyed to the car and it distributes it to the end of the car. Five cars can be loaded per hour.

Thirty-four men can successfully operate the plant, which has an output of 1,500 tons daily, or the equivalent of 25 cars.

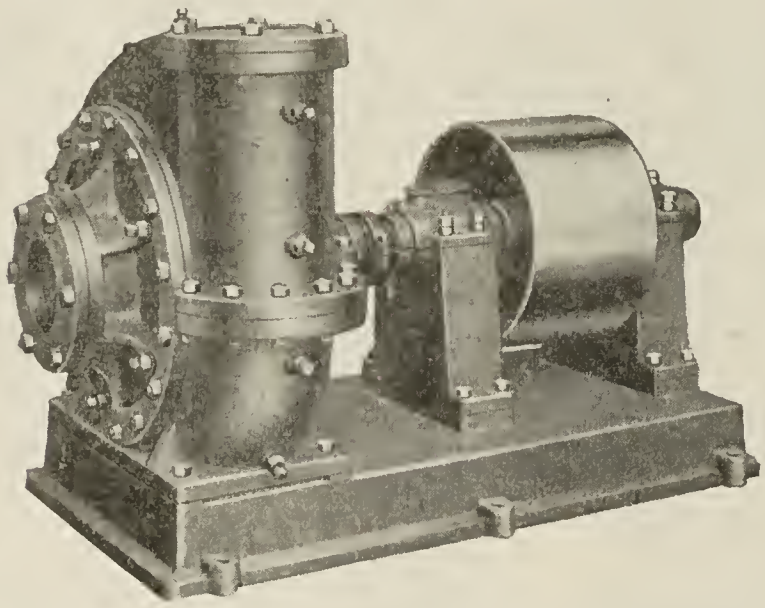
Solid Lined Dredging Pumps

A cenrrifugal pump designed for heavy duty in connection with gravel and sand washing plants is illustrated below. The pump was at first designed for handling of tailings or slimes in connection with gold recovery plants and it was the first pump on the market suitable for this exacting service.

A number are in use in this and foreign countries, and hundreds of them will be found in the gold fields of South Africa.

It has also found extensive use for ordinary dredging and is the best dredging pump built.

These pumps the Morris Machine Works now build in sizes from 2-inch up to 12-inch discharge. The lining is made of manganese steel, or hard cast iron, as



preferred. The lining makes practically an independent pump enclosed within a cast iron casing. Adjustments are made from the outside. There are no bolts or screw holes in the lining. The outer pump case is completely protected by the lining so that no wear can come on same.

By removing the upper half of the pump shell, the lining can be gotten out, or by removing the disc on the pump shell and the inner disc on the lining, the piston can be taken out.

The piston is of enclosed type and made of the same material as the lining.

Everything is of very heavy proportions. The shaft is large, the bearings are of a special type, the stuffing box is made with a view to reducing the wear to the smallest possible extent.

When the lining wears out, which it will not do for a long time, the pump is quickly taken apart and new lining or piston put in and the pump is again ready for service.

Owing to its construction and extremely heavy proportions, it is comparatively expensive as regards first cost, but when compared with its lasting qualities it will be found to be economical in operation.

The Sullivan Plug Drill

A new Plug Drill, manufactured by the Sullivan Machinery Co., 418 Peoples Gas Bldg., Chicago, for use in granite quarries embodies features worthy of note. In general appearance, the new machine, which is classed as the "DH-3" Drill, closely resembled the earlier "DF-3" Drill. Both tools are made throughout of the highest grade of alloy steel bars, and drop forgings, carefully machined, with the working parts ground to exact size, and to exceedingly close working fits. Before grinding, working surfaces are heat treated by special processes to provide the necessary resistance to wear and breakage. Runners will appreciate the light weight of the new ma-

The Sullivan Plug Drill Cutting Granite

chine, only twenty-one pounds. It is 17½ inches in length and has a cylinder diameter of 1 7/16 inches. The "DH-3" strikes a heavier and faster blow than the old drill, which gives it a considerably increased drilling speed and makes it particularly desirable for use in hard granite. On numerous test runs, the "DH-3" Plugger has averaged holes four inches deep with ¾-inch plug bits in Barre granite in fifteen seconds each. A new and essential improvement in this machine is the valve motion. This consists of an adaptation of the valve motion of the Sullivan "DR-6" Water Hammer Mounted Drifting Drill, usually considered the hardest hitting hammer drill in existence. The valve is situated in the rear end of the cylinder, and is entirely enclosed by the head block or housing of the machine. It is of the hollow or shell type and the valve action is in alignment with the motion of the piston. End seats prevent freezing and leakage. This valve is light, saves power, and is not liable to breakage. Its action is not affected by wear, so that the operating economy of the "DH-3" Plug Drills are maintained indefinitely. Air is admitted to the drill by means of a push handle throttle of the same type as that originally developed on the pioneer Sullivan Plug Drill and used since that time in improved form. The blow of the piston is hard and unimpeded, but a cushion is provided at the rear end of the throttle to avoid striking the back head, and at the same time to permit a rapid recovery and sharp forward strike or blow. In addition to increased drilling speed, the "DH-3" carries with it reduced vibration, making it easier for the operator to handle, and a high degree of air economy.

News of the Cement Mills

Construction work on the Davenport, Iowa, plant of the Western States Portland Cement Company has commenced. It is planned to erect a store room and machine shop, which will be part of the permanent building of the plant. A temporary stone crusher will be installed to provide the crushing of stone which will be necessary during construction. A locomotive house will be built.

The lane, known as Nutting lane, from the pavement on the LeClaire road will be paved with concrete 18 feet wide in order to insure access to the plant site by trucks during the coming season. The plant location will be north of the C. D. & M. railway at Nutting Station and the site will cover 30 acres of ground. On this site a portion of the tracks necessary for the complete plant will be built this fall, in order to properly handle the machinery and equipment that will be received from time to time.

Equipment that will be used immediately comprises a Davenport locomotive, an Ohio locomotive crane, a Gates stone crusher with screens, some side dump cars, and other special machinery.

The rock on the quarry site will be stripped of the overlying earth and clay and such material used in bringing the plant site up to the required grade. This material will be handled by locomotive and dump cars. From the crusher location an incline to the quarry will be opened through the rock and a quarry face providing for the quarrying of 40 feet of rock will be exposed. Rock secured in this work will be put through the crusher and used in the construction work.

A water system for the plant will be built with the supply either from the river or from deep wells on the plant site. It is planned to use electric power for all machinery during construction.

The C. D. & M. railway will immediately complete the 2,000 foot siding which they have started to install. It is not expected that the steam road will be able to construct their side tracks and connection this season.

N. H. Tunnicliff of Davenport, will have charge of all work at the Davenport plant as superintendent. H. R. Heeschen, of Davenport, has been engaged to take charge of the field engineering work. R. J. Wilson, of LeClaire, will have charge of the field office. John Boland, of Bettendorf, will be labor foreman and have charge of the quarry operation during the winter.

The company will not maintain a downtown office during construction work but will handle the work from the field office at the plant site near Nutting Station.

The improvements in progress at the Alsen Cement Company's works, Alsen, N. Y., include the erection of a sewage disposal plant with modern sanitary laboratories, a new hospital and a new stock building. Part of this work has been completed, the two laboratories and hospital being constructed of reinforced concrete even to the roofs and are entirely fireproof.

Another important improvement is a giant electric crane, to cost $50,000, the foundation of which 26x27 feet, now being erected. The crane will have a boom of 100 feet spread, sufficient to reach every part of the storage yard where "clinker" is to be handled. In constructing the foundation for this crane 250 cubic yards of cement and 12,000 lbs. of reinforcing steel are being used.

The new clinker pit will be very capacious, 20x40 feet and 20 feet high of foundation and surmounted by a steel tank 24 feet in diameter and 30 feet high.

The new stock house will be a large structure, which will replace the present large building. The foundations are now in progress.

A shed is also being erected over the shipping dock, so that cement may be loaded in any kind of weather, and the dock is to be enlarged so that three boats may be loaded at one time. The shipping output will be 4,200 barrels of cement per day. This dock improvement will permit water communication with all points, and largely curtail dependence upon railroad shipping.

These improvements and others will result in great economies, in labor, operation and repairs. As illustrating this fact, at present there are 16 mills engaged in grinding the clinker into cement. These 16 mills will be replaced by three mills which will do three times the work. A new 200 foot conveyor will carry the clinker into the mills.

A revolution of the power machinery is also proposed. At present power is supplied by three steam engines generating 500 H. P. each and one generating 1,500 H. P., but this is insufficient and a contract has been made with the Upper Hudson Electric Corporation to supply 500 Kilowatts of electrical energy, equal to 450 horse power. It is designed to use electric power entirely at an early day.

With the completion of these and other improvements, the Alsen Cement Co.'s plant will be one of the most up-to-date in the country. The original plant was built according to German ideas, but, in spite of all that was recently said about German mechanical efficiency, the old methods are found to be crude and antiquated in comparison with modern American methods.

It is estimated that the improvements at this plant will cost not less than $500,000.

The Mason City, Iowa, mill of the Lehigh Portland Cement Company was built in 1910 and has five thousand barrels daily capacity, ranking among the large cement mills of the country. The plant and yards cover, all told, about forty acres and gives employment to five hundred people. The company has always been considerate of the comfort and welfare of its employees and a gratifying spirit of co-operation exists between management and men. This is doubtless due to the spirit of mutual consideration which exists on both sides. The mill has had practically no shut down since its start and consequently affords unusually steady employment.

Contrary to common belief, employment in cement mills is shown by careful research to be a very healthy occupation. In fact the experiment now being tried in California of having tubercular people work in cement mills has affected complete cures and proves the soundness of the experiment.

O. E. Davis, superintendent of the plant, has been in the cement industry for about twenty years and has worked his way up to his present position. Mr. Davis and the company are always interested in the welfare and advancement of the men and those holding responsible positions in the plant today are men

who have started in and worked their way up from the bottom. The employees are well paid and working conditions are favorable from every standpoint. The plant is equipped with bath houses, lockers and other modern conveniences, an up to date first aid hospital, which happily is not frequently used, and all of the latest ideas are embodied in the equipment designed to prevent accidents.

Lehigh cement is widely known all over America and the product from this mill shipped throughout Iowa, Minnesota, Wisconsin, the Dakotas, and Nebraska.

The Penn-Allen Cement Co., Allentown, Pa., has purchased new quarry property near Steubens, Bath, Pa., which they are now developing for use at their cement mill.

Inland Portland Cement Co., Spokane, Wash., is rushing work on the building of its new flume from Sullivan Lake to the power plant at Metaline Falls. The work will require about 4 months' time and during that period the cement plant will be forced to close down and the town will be without electric lights. Demand for cement is so great that the company's stock is being rapidly depleted.

Bath Portland Cement Co. stockholders have voted to increase the capital stock from $700,000 to $2,500,000. The money is to be used for a new plant near Easton, Pa.

The Acme Cement Co., Catskill, N. Y. has chartered four large boats for use in shipping its cement products from Catskill Creek to delivery points. During the past summer the Acme has made several shipments from Catskill Creek to Boston, and it is understood the chartered boats will be used for this purpose, its trade in that direction being an increasing one. The chartered boats include one large freight steamer and four capacious barges.

The Sydney Cement Co., Sydney, N. S., whose plant has been closed since the commencement of the war has been purchased by the Dominion Steel and Iron Corp., who will start manufacturing cement as soon as a number of alterations and additions to the plant are made.

W. H. Green, superintendent of the National Cement Co., Ragland, Ala., wants cement mill mechanics for the old Coosa cement plant now being remodeled for immediate operation. Also in market for belt conveyors and rock screen, 60-inch diameter.

Two men were killed and one injured in an explosion in the quarries of the Atlas Portland Cement Company at Hannibal, Mo.

"It is a well known fact that cement has been a comparatively scarce article this season and a considerable quantity of work has been postponed because of inability to get cement," said C. B. Condon, general manager of the Hawkeye Portland Cement Company, Des Moines, Ia., when asked regarding conditions in the material business.

"This situation was brought about almost entirely by the strike of the soft coal miners during November and December, last. The cement manufacturers supplying middle west territory generally, burn coal exclusively in making cement, and on account of the strike their operations were paralyzed during November and December. These are the months when, under normal conditions, cement manufacturers fill their warehouses so as to have surplus stock to take care of customers' requirement throughout the building season.

"On January 1, 1920, there was on hand in the warehouses of the mills supplying this territory less than 100,000 barrels of cement, as compared with over 2,000,000 barrels on hand in the bins of these same manufacturers January 1, 1919.

"The state of Iowa consumes on an average of about 3,500,000 barrels of cement annually, so that the manufacturers lost in production during November and December enough cement to supply 57 per cent of all the cement that would be used in Iowa in an entire year.

"From present indications, cement manufacturers will be able to operate during the coming November and December, and should be able to produce a normal year's tonnage for consumption during 1921. This will make the situation much easier and conditions may be practically normal as far as cement supply is concerned.

"Transportation conditions in the last few months have improved materially, the railroads moving freight much faster than for the past few years. This naturally releases equipment and increases the available supply of empty cars. The roads are now assured of revenue so that they can increase their power and car supply, all of which will tend to make the building season of 1921 far more comfortable and satisfactory than it has been this year."

Indiana is rich in raw materials for the manufacture of cement, but it is sometimes difficult to obtain the essential combination of factors for plant location, according to a report made by Dr. W. N. Logan, state geologist, Indianapolis, Ind., to the state department of conservation.

The demand for cement at the present time exceeds the supply, says Dr. Logan. Renewal of construction work held in abeyance during the war, extensive road building programmes and transportation difficulties for certain materials have each contributed to the increased demand.

Raw materials for the manufacture of cement in Indiana are almost unlimited and inexhaustible, according to Dr. Logan, but a plant location requires an abundant water supply, ready access to transportation, high aluminous clays or shales and low magnesia limestones.

The British Columbia Cement Co., Victoria, B. C., operate plants at Tod Inlet, daily capacity 3,000 barrels and Bamberton, daily capacity 2,000 barrels. They are installing a coal plant at their Bamberton works, using Raymond mills and Buckeye dryers. Heretofore they have used fuel oil at the Bamberton works but cannot now obtain same. R. P. Butchart is president and managing director and Edward Tomlin is director and treasurer. Ocean and railroad shipments are made from their docks at their works. Capacity 1,500,000 barrels annually.

With no signs of early improvement in the cement situation in Texas, the agitation in favor of the state building and operating a plant for the manufacture of the material is growing. At the last special session of the legislature a committee of members was appointed to investigate the question of the state entering into the manufacture of cement and to report at

the coming regular session, which is to meet next January. In addition to this legislative investigation, the Texas Road Builders' Association, through R. G. Tyler, president, has appointed a committee to make a similar investigation. This committee is composed of Prof. F. E. Giesecke, Austin, chairman; D. D. Panas, Houston; R. J. Potts, Waco; J. M. Howe, Houston, and R. V. Glenn, Fort Worth. There are at present five cement manufacturing plants in Texas, and according to builders and contractors, these concerns are entirely inadequate to the demand for the material. Big quantities of cement are now being shipped to Texas from Oklahoma, Kansas and other states. Efforts have been made to purchase cement from mills as far away as San Francisco, but without success.

Dr. J. C. Nagle, dean of the Department of Engineering of the State Agricultural and Mechanical College, who has gone to considerable trouble to investigate the cement shortage and the possibilities of the state engaging in the industry of manufacturing the material unhesitatingly says that there is room for another cement mill in Texas. He points out that the annual demand for cement in this state in ordinary, building activities is about 2,000,000 barrels, and that an additional 1,000,000 barrels are needed for highway construction. The total capacity of the cement mills of Texas is about 500,000 barrels short of the present annual demand of the state, and this shortage will become greater as the building development increases.

The Link-Belt Company is now ready to distribute its 32-page book No. 345 entitled, "Link-Belt Silent Chain Drives for Cement Mill Equipment." Page 9 gives reasons why this drive is ideal for operating ball mills, tube mills, kominuters, conveyors, elevators, line-shafts, quarry-hoists, kilns, dryers and bag filling machines. These reasons are substantiated by succeeding pages which show many drives in actual operation.

Managers, engineers, superintendents and other officials of cement mills will find it to be a very interesting and valuable book. Copies will gladly be sent on application to the executive offices of the Link-Belt Company, 910 S. Michigan Avenue, Chicago, or any of its branch offices.

The old Coosa cement plant at Ragland, Ala., is being remodeled and the capacity increased. A new jaw crusher 36x60 inches, new locomotive, cars, etc., are being installed. The plant was purchased by Geo. E. Nicholson, Commerce building, Kansas City, Mo., and associates and will be known hereafter as the National Cement Company.

Pyramid Portland Cement Co., Des Moines, Ia., has begun construction of its $2,000,000 plant west of Valley Junction. It is expected to have the plant in operation in 1921. The plant will use the wet process, with three 175-ft. kilns. The waste heat of the kilns will be recovered and utilized for the boiler plant. The capacity will be 2,000 barrels per day of "Pyramid" brand cement. The Pyramid Portland Cement Co. was incorporated on November 14, 1919, under the laws of Iowa, by the following officers and directors: President, John L. Bleakley; vice-president-general manager, E. Struckmann; secretary, Wm. A. Harper; treasurer, A. O. Hauge, directors, E. S. Tesdell, Howard A. Nichols and John F. Carey, together with the officers first mentioned. The main office of the company is located at 821 Fleming building, Des Moines.

In line with the warning from President Wilson to the anthracite coal miners, that should they refuse to produce, the American people would take some means of supplying themselves with fuel, a step has been taken by the Bath Portland Cement Company, in the very heart of the famous "Rock Products" region. Vice President Louis Raffetto of Philadelphia, and Vice President Fred B. Franks, of Bath, Pa., for several weeks have held conferences with mechanical and engineering experts and have just decided on a move which it is believed will be revolutionary in its fuel-saving effects, says the Easton, Pa., Press.

Under the plan adopted it is proposed to use the heat from the kilns, which now goes to waste into the air, for the production of the steam for the plant. The kiln heat is 1,500 degrees Fahrenheit, and engineering science has convinced the officials that at least seventy-five per cent of this wasted energy can be harnessed.

With this object in view they have awarded a contract for a complete new set of boilers from a Philadelphia concern which has the reputation of being the leading making establishment in the world, at a cost of a quarter of a million dollars. When the improvement has been installed, early in 1921, the superheated waste gas from the kilns will be passed under the boilers without coal firing.

In this one plant alone the fuel-saving system will conserve no less than 4,000 pounds of coal an hour, or 48 tons a day, and with coal ranging from $10 to $14 a ton, it is easy to figure the economies of the move, which will approach $200,000 a year. Managers of other heavy coal using plants are vastly interested in the experiment.

In the Lehigh cement region alone the successful utilization of waste heat would amount to a saving of $4,000,000 in coal annually, and there are scores of other industries in the Lehigh Valley where the same general principle of conservation of fuel could be applied.

The Schaffer Engineering & Equipment Company of Pittsburgh announce the Schaffer-Crow furnace with Schaffer-Crow coal injectors for use in connection with rotary kilns. By the peculiar heat treatment arising from this distinctive and modern piece of apparatus they anticipate revolutionary heat treatments of all rotary materials. They will have further information as to all actual comercial results to announce at a later date.

The suit of the Peerless Portland Cement Company against the director general of railroads and the Michigan Central Railroad Company, was heard by F. H. Barclay, inspector of the interstate board of commerce commission in the circuit court room, Jackson, Mich. The dispute is over freight rates the claim being that a minimum freight rate of $15 per car applied to the complainants shipment of wet marl from Spring Arbor to Union City is unreasonable and discriminating.

The complainants ask that the overcharge which is the difference between $5 and $15, be repaid. The former amount it is alleged should have been charged as a minimum rate. The interstate commerce commission is also asked to prescribe lower freight rates. Following the hearing, a report will be submitted to the interstate commerce commission at Detroit by Mr. Barclay.

The Peerless Portland Cement Company was represented by John C. Graham, Jackson and William Hatch of Union City. The director general of railroads is represented by Royal McKenna, Washington, D. C., and the Michigan Central railroad by an attorney.

News of the Concrete Products Factories

"Service starts at the factory. Modern trade requirements demand better quality block. Considering the tamped process, for a moment, better block require heavy tamping, preferably by mechanical means," says A. J. R. Curtis of the Portland Cement Association. Heavy mechanical tamping requires that the machine be securely anchored to a heavy base. Most of our bases are too light. In some plants the machines have learned almost to walk. Every useless movement helps to wear out the machine, bend, twist and distort the parts, make operation more difficult and the product less perfect. Why not secure these machines to permanent or moveable concrete bases?

"Another machine feature which might well have more attention is the mold box. Some of these are rather carelessly made at present. A little extra machining, to make the box fit more accurately would not be amiss. I should like to hear some discussion on the possibilities of the relative advantages of cast iron and machined steel plate mold boxes.

"The wet mold systems also are capable of improvement. Smoother, better surfaces and stronger block can be obtained with less water, without interfering with the speed of manufacture, by the employment of an approved vibrator, mounted preferably under the truck in front of the mixer. The manufacturers of molds should sell or at least advise the use of vibrators. Properly vibrated, wet molds can use mixtures of almost ideal consistency."

The ability to perceive and to take advantage of a situation is a measure of a man's business capacity.

When it was decided to install water meters in his town, William Acheson, Superior, Neb., knew there would have to be a place provided in which to set them.

He designed a cylindrical concrete shell provided with attachments for covers and secured the approval of the designs by the local authorities.

He then made up a stock of boxes and waited for the demand. It came and several hundred boxes were sold and installed at a neat profit.

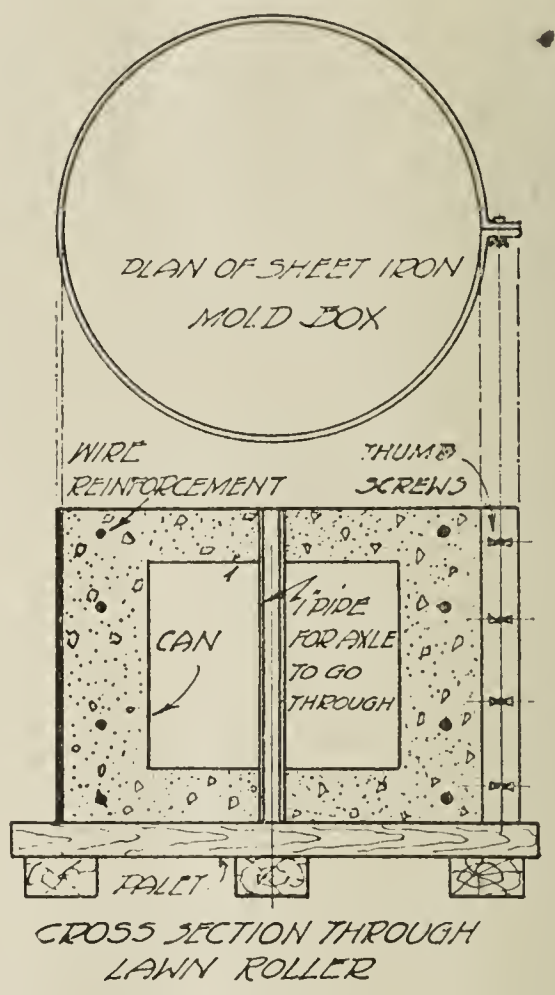
"Our kinks in seven years in the concrete products manufacturing business have to do with concrete drain tile. They give good satisfaction to the farmers, writes W. F. Schweiterman, Osgood, Ohio. We make our tile of a rich mix. Farmers use them for culverts and give better satisfaction than glazed sewer pipe. They use our tile for chimneys—slip an 8" tile in a 12" and fill the opening between with sand or concrete. Use cull tile to make foundation piers by filling the tile with concrete.

"Also use large tile to make end fence posts by setting one 16" tile on another; set in reinforcing rods and fill with concrete.

"I am also interested in a factory here that manufactures hollow concrete drums with corrugated surface for land rollers or clod crushers. These give better service than steel drum rollers."

The Baumgardner Concrete Products Co., Tiffin, Ohio, writes: "We are now making up our stock of concrete lawn rollers for spring delivery. The accompanying illustrations show a kink we use in making them light in weight and yet have a large diameter, which makes the roller easy to handle.

"We make them 24" in diameter and 18" wide, and they weight about 300 lbs. From the local garages we get empty grease and oil cans which usually go to the dump. A 5-gal. Polarine can is just the thing for this size roller. This answers as a core and lightens the roller and saves concrete."



How the Roller is Made

Reinforced concrete pipe design is ever developing and one of the latest types of pipe joints is that made by the United Concrete Pipe Co., 30 Church street, New York. Unusual means have been taken to insure the pipe having walls of uniform thickness with the joint faces truly concentric. The belland spigot castings are machined thereby removing any inequalities peculiar to save mold castings.

Edgar Golden, 1235 Harrison street, Hammond, Ind., has three Ideal machines busy turning out concrete blocks. Two are electrically operated and equipped with tampers and one is a hand operated machine. He has two Coltrin continuous mixers, twenty transfer cars and two motor trucks. He gets 18c for plain blocks delivered.

The Granitetose Brick & Concrete Mfg. Co., R. H. Waycott, president and general manager, 1315 Curtis street, Denver, Colo., recently incorporated, capital, $100,000; share, $100 each, fully paid and non-assessable of which 70,000 shares are to be sold as treasury stock for the benefit of the company as may become necessary for the purchase of machinery and improvement of the plant. The company owns six acres of sand and gravel land on the bank of the Platte river in the city limits and erected thereon a small factory.

They will sell sand and gravel and manufacture bricks having purchased a Helm machine. In the spring they will purchase other equipment for making roofing tile, silos, fence posts, drain tile, sewer pipe, culverts, etc.

Chas. V. Walsh, 58th and Woodland avenue, Philadelphia, Pa., manufactures concrete brick using Peerless machines and Blystone mixers. He is interested in waterproofing compound, mixers, crusher, rack conveyors and facing materials such as mica spar crystals, crushed marble and white sand.

Waupaca Cement Products Co., Waupaca, Wis., has a plant equipped with modern machinery including an Ideal block machine, Dunn drain tile machine, New Monarch Machine and Stamp Company's stave silo molds, Anchor tamper and a Blystone mixer. Is interested in roofing tile machines and building blocks machines.

L. V. Thayer sole distributor of the Peerless cement brick machinery is having big success with the Peerless machine. He is just completing a $65,000 plant for the Gray Cement Block & Stone Co., Belmar, N. J.

The Concrete Products Co., 2399 Broad street, Trenton, N. J., is using Peerless brick machines. This firm is furnishing concrete brick for the new Treat hotel which is being built in Trenton at a cost of $1,000,000.

Chas. V. Walsh, building material dealer, 58th street and Woodland avenue, Philadelphia, Pa., writes as follows concerning his Peerless brick machine installations, viz.: "It is very seldom that my men do not have ten thousand (10,000) brick per machine made and in the driers before 2 p. m., sometimes getting finished as early as 1 p. m. Each machine makes ten thousand brick daily in anywhere from six to eight hours—according to how fast the men work. All my men are on piece work (ten thousand being a day's work) and as soon as they finish they can go home.

"I have seen a good many other concrete brick machines in operation, but none that I consider anywhere near equal to the Peerless in speed, durability and making a brick that is as near to being perfect as the human hands or machines can make them.

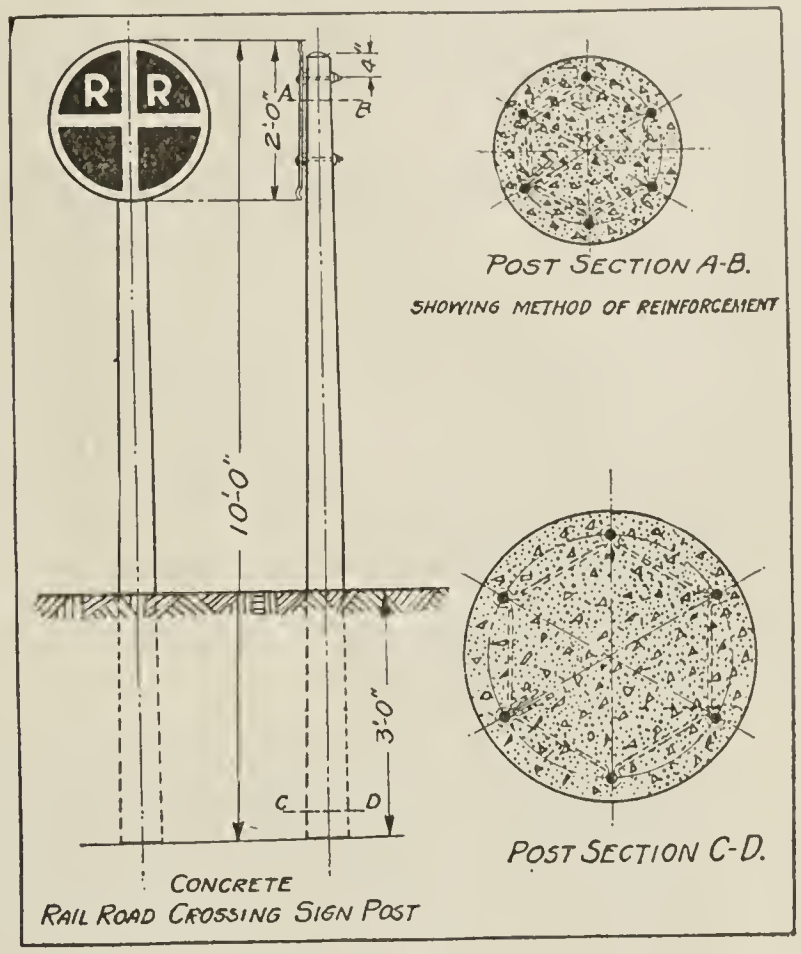
"I should be glad to have any one or several prospective purchasers of Peerless machines visit my plant and watch the operation of these machines for a time or better still for entire day and see just what can be accomplished in a day's run."

Waterbury Concrete Block Co., M. B. Moore, manager, 27 Hickory street, Waterbury, Conn., recently incorporated, capital $25,000, have purchased a block machine and a Lansing mixer and would like catalogs and prices on roofing tile machines, fence post molds, brick machines, silo molds, waterproofing compounds, crusher and facing materials. Their blocks sell for 30 cents.

The Madison Concrete Products Co., Madison, Wis., has worked up a good line of business in railway crossing sign posts.

The post is 10′ long, 3½″ in diameter at top and 5¾″ in diameter at bottom. The sign is of enameled metal, 24″ in diameter—colors navy blue and white. They are also operating an active fence post plant, using equipment manufactured by the National Concrete Machinery Co., Madison, Wis. They have made a good many sign posts for the State of Wisconsin, and are now making them for the State of Illinois.

The Madison company also has a good business in concrete block.



DETAILS OF A SIGN POST

It is stated that the Wetzel Supply Company, New Martinsville, W. Va., recently incorporated with a capital stock of $50,000, will manufacture concrete building blocks. N. N. Oblingerm and W. E. Wharton organized the company.

The Furr Construction Co., Concord, N. C., recently organized, capital $10,000, will manufacture concrete sewage disposal tanks, portable septic tanks, etc.

Ideal Concrete Products Co., 76 Dorrance street, Providence, R. I., Leon E. Danforth, president, are building an extension to their plant giving them about 6,000 square feet of manufacturing space. They operate an Ideal block machine and a mixer purchased of Waldo Bros. & Bond Co., Boston. Want catalogs and prices on machines and molds for making brick, roofing tile, building tile, building blocks, chimney blocks, vases, porches, septic tanks, fence posts and flower boxes, also tampers, rack conveyors, mixer, crusher, facing materials such as mica spar crystals, crushed marble and white sand.

H. E. Erickson & Co., 114 South Third street, Minneapolis, Minn., have placed upon the market the Papke block machine and Nelson block and brick tamper. From four to six strokes only are required of the Nelson tamper for the completion of each block—affording increased output on any machine. Mounted on the Papke block machine, wet material is handled without fear of sagging. All sides of the machine strip the block in a gliding movement. The Nelson tamper and Papke block machine has great records for speed and does the work well. The tamper is adapted for use with any standard block or brick machine.

The Porter Cement Products Co., H. J. Porter, manager, Barberton, Ohio, has been incorporated, capital $10,000.

Watertown Concrete Stave & Silo Co., Watertown, S. D., has been incorporated, capital $100,000, by J. J. Heimark, H. K. Solberg and H. R. Hanson.

The Boyne City Silo Co., Boyne City, Mich., has equipped its plant here to build concrete silos and other concrete products.

The New Jersey Cement Block Co., Newark, N. J., has been incorporated with a capital stock of $125,000 by Bernard Schweitzer and L. W. Crosby.

Peter E. Hoffman, a pioneer cement block manufacturer of Utica, N. Y., is now located in his new, modern factory building, 50 feet wide and 500 feet in length, at Sunset avenue and Wager street, extending to the N. Y. O. & W. railroad tracks. Freighting accommodations are provided for; the building is equipped with up-to-date machinery, having a capacity of 5,000 block a day. In addition to these he manufactures cement fence posts, drain tile, roofing tile and cement shingles.

The Watertown Tile & Construction Co., Watertown, S. D., manufacture everything in concrete for the farm. They operate Quinn and Pioneer drain tile machines, Ideal block machine and tamper, S. T. Playford stave silo molds, two Blystone mixers, and one Wonder mixer. Are interested in vibrating machine. Want prices, catalog and information.

The Ideal Concrete Stone Co., Omaha, Nebr., reports splendid business. They operate an Ideal block machine and tamper and a Blystone mixer. Want prices and samples of crushed marble and white sand for facing blocks.

C. F. Procknow, proprietor Fond du Lac & Winnebago Vault Co., 58 East Johnson street, Fond du Lac, Wis., manufactures steel reinforced waterproof cement burial vaults, using Norwalk Vault Company's molds. Is interested in molds for making vases and flower boxes, also facing materials such as mica spar crystals, crushed marble and white sand.

Laurel Brick & Sand Co., Middletown, Conn., operate an up-to-date concrete brick manufacturing establishment, which is equipped with the latest improved machinery, including a Helm brick machine and a Blystone mixer. Is interested in a waterproofing compound crusher and facing materials.

Cement Products Co., Wilmington, N. C., manufactures concrete portable sewage disposal systems, using their own forms. They also manufacture concrete brick, using Helm machines and drain tile, using a Dunn machine. Is interested in mica spar crystals and crushed white marble for facing.

Fellabaum Bros., Toledo, Ohio, operate a modern concrete products plant and report business extra good. They have a Walter cement roofing tile machine, Besser block and brick machine and a Jaeger mixer. Are interested in building tile, chimney blocks, drain tile and sewer pipe machines; want prices and catalogs.

Mark Monaghan, silo contractor of Malone, N. Y., recently built for the Old Line Coal Co. of Malone four concrete coal pockets, each 56′ high by 16′ diameter inside. The walls are 6″ thick. Polk system forms were used.

Frank R. Wood, care of Department Public Works, State Hospital, Dixon, Ill., is investigating conditions in the south near Baton Rouge, La., in regard to possibilities offered in manufacturing silo and building blocks. Wants prices and catalogs on machinery and facing materials.

The building of cement blocks at the State Epileptic Colony, Frank R. Wood, superintendent, Dixon, Ill., has increased to such an extent since its inauguration last winter that it has become an extensive enterprise and one that furnishes employment for a large number of men, many of them patients at the institution. Last winter the state department of welfare authorized the use of one of the colony buildings which was then not in use, for the manufacture of cement blocks with Ideal block machines. Several men were employed in the plant and many of the patients at the institution were given employment in the plant turning out cement blocks which are to be used in the building of other structures and extending the colony. Today the plant is turning out more than 500 of the blocks daily. This department at the colony has received orders during the summer for 108,000 cement blocks to be used in the extensive building property which is planned for the state property and to date between eighty and ninety thousand of the blocks in this order have been supplied. All of the cement blocks required in the proposed buildings of the moron colony and the new epileptic colony are being supplied from the institution. The cement is hauled from the Sandusky cement plant east of the city and a very fine quality of gravel is obtainable from the quarry on the state property.

The London Concrete Machinery Co., London, Ont., recently changed hands, but will continue to manufacture concrete mixers, carts and contractors' equipment under the same name. The new organization has been issued a new charter with a capital of $500,000.

Saginaw Concrete Products Co., 1000 North Washington avenue, Saginaw, Mich., operate Besser and Ideal block machines, Ideal tamper and Blystone and Ideal mixers. Are interested in mica spar crystals and crushed white marble for facing blocks, roofing machines, building tile machines and drain tile machines.

Sawyer Cement Stone Co., North Second street, Rockford, Ill., manufactures blocks and burial vaults. Wants prices and catalogs on burial vault molds, vase and flower box molds.

To Build Trucks and Tractors

The Traylor Engineering & Manufacturing Co., Allentown, Pa., manufacturers of jaw and gyrator crushers, crushing rolls, mining, milling and smelting plants, cement-making machinery, etc., announce the conversion of its large shipyard at Cornwells, Pa., into a plant for the manufacture of motor trucks and all-purpose tractors "of a quality equal to the best and which average up with the older and world-known Traylor products."

Cement and Engineering News

Vol. 32 Chicago, December, 1920 No. 12

Bible Institute at Los Angeles Built of Concrete

The Bible Institute of Los Angeles is one of the most unusual concrete structures on the Pacific coast. The building consists of two separate hotels, an auditorium seating 4,100 persons, and various class rooms. This is said to be the only institution in the world, that maintains two independent hotels, an auditorium, and class rooms for religious instruction, combined.

The men's hotel occupies thirteen stories on one side of the building, and the women's hotel occupies thirteen stories on the other side of the structure, the auditorium occupying the space between the two thirteen-story structures.

There are three roof gardens, one on the roof of the auditorium, one on the women's, and one on the men's hotel roof. In order to provide light for the auditorium, a large space of the auditorium roof is covered with sky-light. A double concrete wall runs around the roof garden that occupies the roof of the auditorium. Between these two walls there is a flower garden.

In the women's hotel there is a large laundry for the free use of the guests. There is a club room for the men and one for the women. In addition to this there is a social room for both men and women which extends along the eighth floor, from the men's hotel to the women's hotel. In front of and extending the entire length of this club room there is a balcony, which can be seen in the illustration.

A set of chimes is installed on the roof, which can be heard throughout the business section of the city. The loft from where the bells are played is located on the roof under the bells and is finished in stucco.

This institution maintains a large power plant and furnishes light and power to many buildings in the neighborhood. The entire structure is built of concrete and is absolutely fireproof. The building cost approximately $1,800,000, an architect was employed in drawing up the plans but the structure was built by the institution. The front of the building has a very artistic finish, the entrance to the auditorium being through a number of arches.

Editorial

A Vital Message to Business America

This is the time for every brain and hand to utilize every atom of energy, every constructive thought, every helpful suggestion that will furnish more power to the business motor.

This is the time when the generals of business must take off their coats, roll up their sleeves, spit on their hands and re-vim every department, inside and out. One hundred per cent management must register 110 per cent and more.

This is the time when raw material men must join forces with manufacturers, without fear or favor, to keep production on an even keel, with both hands on the wheel.

This is the time when manufacturers must co-ordinate their interests with wholesalers in a will to win by working together.

This is the time when wholesalers must co-operate to the fullest extent with retailers by the suggestion of better selling methods. Showing a merchant how to sell more is to show him how to buy more.

This is the time when the entire sales organization should be on the road selling prosperity, and star salesmen should not ignore the one-night stands. Beating the brush for business is more profitable than killing time at home.

This is the time when retailers must take advantage of every legitimate means of inducing business by catering to the public needs at equitable prices for dependable goods. Business may be encouraged when it cannot be forced.

This is the time for the salespeople behind the counter to remember that truth, courtesy and smiling service are the three great assets of personal success.

This is the time when the business whiner should be ostracized, the grouch banished, the discouraged inspired.

Inertia begets inertia; every complaint imagines another.

Super-effort in the sanctum, office, factory, on the road, behind the counter, will do more to blow away the clouds of uncertainty and put business on a soundly economic basis than all the theories that ever have been or ever will be expounded.

This is the time—let's all go to work for the new era of real prosperity.

Building Roads—and Business

Business men are thinking of the future—the years to come which are of such definite importance in the extension and promotion of our national life. Our immediate future is a business future. Success or failure depends upon its intelligent handling.

Production and distribution are the basic fundamentals of farm and city activities throughout the entire country, each dependent upon the other.

For the purpose of distribution we have the railways, waterways and highways. Present action is necessary in the improvement of all of these to make possible any proper extension of business enterprise.

At present, we have some fifteen thousand miles of inland waterways—350,000 miles of railways and more than two million miles of highway. Of the highways, less than one-tenth are in any sense improved.

Business expansion depends primarily upon efficient concrete highway development. This fact has become self-evident. We have an imperative need of through connected, properly constructed highways, wide enough to carry the ever-increasing traffic and built in a manner to assure permanence for the economic transportation of food and manufactured products, not only to the railroads, but directly from the source of production to the point of consumption. We have the idea of this national need exemplified in the Lincoln Highway.

A nation can make a greater profit from a real system of highways than from any other source. Eliminating the present waste existing as a result of the difficulty of getting farm products to city markets over poor roads would of itself pay for the permanent construction of all the highways the country needs and make a net return of literally millions of dollars to the nation as a whole.

The Golden Rule in Business

Some years ago Willis L. King, Vice-President of the Jones & Laughlin Company, one of the greatest steel concerns of America, in an address before the American Iron and Steel Institute, took as his subject "The Golden Rule in Business."

Mr. King claimed that in every business relation, whether dealing with customers, competitors or employes, it was possible to follow the Golden Rule as the surest guide in all business dealings. His address was enthusiastically received by the hundred of leaders in the iron and steel industry who were present.

Since that meeting there has been a widespread development of the thought that in all human relations men should strive to put into practice the divine command to do unto others as we would that they should do unto us. But what a revolution in human affairs would be inaugurated if all men practiced that doctrine!

If all employers would honestly put themselves mentally in the place of their employes and then study the meaning of that command, there would be a mighty change for the better.

If all employes would put themselves in their employer's place and endeavor fully to carry out that teaching, there would be no slacking, no inefficiency, and no effort to browbeat and bulldoze other men who did not belong to their particular union.

If all buyers and sellers would faithfully do unto each each other as they would wish others to do unto them under similar circumstances, honesty would everywhere prevail, and the world's business would move forward to a higher and nobler plane, with larger prosperity for all.

No man is living a true life, no man is doing his full duty to himself and his fellow-men as employer, or employe, as buyer or seller, who cannot conscien-

tiously say that to the very best of his knowledge he is seeking to carry out this supreme rule of human conduct.

No man is thoroughly honest at heart who is not willing to examine himself to see if his motives square with this divine command, which is just as binding as those which say, Thou shalt not steal, thou shalt not murder, thou shalt not commit adultery. Men may follow these commands and still utterly fail if they do not follow that other command which says "Whatsoever ye would that men should do to you, do ye even so to them." It may be well-nigh impossible to attain unto that heavenly height of conduct but it is possible to strive unceasingly and honestly to do so.

Labor Saying Devices

For reasons that are too obvious to require discussion, industrial conditions call for the employment of labor-saving methods.

It isn't always because contractors do not know ways that call for less man-power that they do not use them; it's more often because they are used to other ways and hate to get out of the rut.

For instance, it has always been the custom to take down old stone and brick walls with pry bars, cold chisels and hammers wielded by a lot of laborers. The contractos who employ these slow and expensive methods, as a rule, know that the work can be done with dynamite in much less time, with fewer men and at less cost, but the rut holds them firmly to the old way.

A contractor in Gainesville, Florida, was doing some work for the Florida Industrial Corporation. He had to remove a brick wall 150 feet long, 22 feet high and 18 inches thick. It was a hurry-up job, and for once, rut ideas were laid aside.

The wall rested on a concrete foundation 18 inches below the ground level. It was desired only to take down the wall to the surface; it wasn't necessary to disturb the concrete.

Twenty-six holes were cut into the wall just above the ground. Two and a half pounds of 30 per cent ammonia dynmite were tamped with clay in each hole. The charges were connected up in series and fired with electric blasting caps.

The wall was cut down as clean as a whistle at the ground level. The work was all done by one man in less than a day. The total cost, including labor, was about $26.00. That would about pay the wages of five laborers for a day, but five laborers would have taken several days to tear down that wall.

Isn't this a good time to give a little thought to man-power saving methods?

Fall Maintenance for Concrete Pavements

Concrete roads have no rest from traffic. Winter and summer alike their dependability holds out a standing invitation to use regardless of weather conditions. With the surface of pavement well maintained, with proper attention given to dressing up shoulders so that they drain quickly, and with organized snow removal programs, our highways this winter will more than ever before prove how important a link they are in the transportation of food and other necessities.

Although the maintenance that well built concrete pavements require is insignificant by comparison with similar work on any other type of construction the "stitch in time" means just as much. Unless thorough attention is given to filling cracks and joints in the slabs water may penetrate to the subgrade, freeze, expand and cause unequal heaving of slabs thereby subjecting them to uncalled for punishment by traffic. Pavements must be gone over systematically and thoroughly, all cracks cleaned and swept out, evenly filled with hot bituminous material and covered immediately with coarse dry sand. Such treatment properly done will effectually prevent surface water from entering the subgrade. Shoulders and side ditches should be dressed up and cleaned so that they may freely remove surplus water from rains or melting snows.

Our Highways—the Arteries of the Body Politic—Through Them Flows Our National Health

No man can learn save by the inspiration of the master. Even if a man be born to genius, he must have the master's inspiration, else he will be ignorant of the idea.

And by the same token we get evil, but it is said no healthy man naturally takes to wrong.

Robert G. Ingersoll once said that he would make health catching instead of disease. We have since learned this is so—and further, that both are equally catching. From ancient days we have the miracles where, by simply touching the garment of a perfect man, virtue issued.

It so issues today. The world is actually held up by such. But, like sunlight, it is so prevalent we cease to marvel.

The Secret of Life

We have but to open ourselves to the receiving of it, and it is given. It is the great secret of life how to do this, and those who possess it do not know it is a secret, because it is a great and common gift. Prove it—look around and see a world of happiness everywhere. If it were not so the world of life as we know it would have ceased long ago.

It is the basis of society which, by the natural instinct of healthy man, lives but for the creation of such a world.

Open Wide the Gates

Therefore, open wide the gates to that world, so among the throngs passing by, will come also masters of light, whose perfect health will inspire to emulation.

Compared with this prospect, of what account is the cost of highways if, by the building of their enduring concrete, we connect ourselves with the fire of life, that those dwelling in darkness need only to touch to be themselves aflame?

To be sure Satan—death—comes also. But he is only an incident to the healthy, enlightened mind.

F. BAACKES,
Vice-Pres. and Gen. Sales Agent, American Steel & Wire Co., Chicago.

A Correction

The very interesting articles in the November issue of CEMENT & ENGINEERING NEWS on pages 27 and 32, entitled "Quarry Stripping with a Revolving Shovel" and "Steam Shovel Lowered into Quarry" were reprinted from "The Excavating Engineer," and as we failed to give due credit in the articles to this publication, we take pleasure in doing so in this issue.

Should the State of Texas Engage in Portland Cement Manufacture?

When an engineer undertakes to estimate the cost of producing a manufactured article, he should take special care to ascertain the annual output factor, or the average output rated as a percentage of the annual capacity of the plant. We have before us an estimate of the cost of manufacturing portland cement in which the estimator has assumed that the output factor would be 100 per cent. As a matter of fact the biggest year's output of American Portland cement mills was less than 75 per cent of the total capacity of the mills; and the average output factor over a period of six years was about 66 per cent.

The total capacity of the Portland cement mills of this country is variously estimated at 125,000,000 to 140,000,000 bbls. per year. The output by calendar years has been:

Year.	Bbls.
1914	89,050,000
1915	86,710,000
1916	92,360,000
1917	93,450,000
1918	71,510,000
1919	80,490,000
Average for 6 years	85,600,000

This annual average of 85,600,000 bbls. is 66 per cent of 130,000,000, which is a conservative estimate of the capacity.

In a paper read before the Texas Road Builders' Association last June, Prof. J. C. Nagle, Dean of the School of Engineering of the Agricultural and Mechanical College of Texas, gave the following estimate of the cost of a cement mill of 1,000 bbl. daily capacity:

Buildings	$165,000
Machinery and power plant	300,000
Quarry equipment	35,000
Industrial tracks	15,000
Total	$515,000
Interest at 6%, assuming 12 months for construction	$ 15,450
Organization expense, assumed at 5%	25,750
Contingencies, assumed at 10%	51,500
Total overheads	$ 92,700
Total construction cost	$607,700

Prof. Nagle estimated the annual fixed charges and operating expenses as follows:

Interest at 6% on $607,700.00	$ 36,462
Depreciation at 5% on $515,000.00	25,750
Labor and superintendence	100,000
Fuel oil (100,000 bbl. at $3.50)	350,000
Power (1 hp. per bbl., or 1.5 ct. per Kw hour)	81,000
Repair parts and general supplies	45,000
Total estimated annual operation cost	$638,212

Prof. Nagle then assumed an output of 300,000 bbl. per annum, which is equivalent to a full 100 per cent capacity output every working day in the year. This would result in a cost of $2.13 per barrel. He estimates that the average mill price is 34 to 45 ct. per barrel in excess of this estimated cost of $2.13. But let us see what the estimated cost would be were the output factor 66 per cent, or in this case about 200,000 bbl. per annum instead of 300,000. His interest and depreciation charges then would be 31 ct. per barrel instead of 21 ct. Fully 40 per cent of the wage and salary expense would remain unaffected by changes in the output factor, so that it would cost 7 ct. more per barrel for wages and salaries under a 66 per cent output factor than under the 100 per cent output factor assumed by Prof. Nagle. Hence even under a high output factor of 66 per cent there would be a cost of fully 17 ct. per barrel higher than that estimated by Prof. Nagle.

Prof. Nagle tacitly assumes his estimate of cost of production of cement to be complete, for he goes on to estimate that the state of Texas could save at least $102,000 a year over the lowest existing market prices were it to own and operate such a plant. We fail, however, to find any items to cover insurance, taxes, lighting, miscellaneous office and general expense. A state owned plant would not pay taxes, but by as much as it did not do so it would throw the tax burden upon other property and thus upon the public.

We note that electric power is estimated at 1.5 ct. per kw. hour, which is too low. It is true that such a rate for high load factor service is still to be had in Texas, but public utility power companies are struggling to secure rates that will be remunerative, and with $3.50 oil no such company can live when the power rate is 1.5 ct. per kw. hour even for high load factors. Assuming 230 kw. hours at the bus-bar per barrel of oil, the cost of oil alone is 1.52 ct. per kw. hour without allowing for losses in transmission and transformation.

It is not our purpose to analyze in detail Prof. Nagle's estimate, but rather to point out the error in using an output factor of 100 per cent. This sort of error is still very common among engineers. There are, for example, numberless printed estimates of the cost of generating power in which the estimator has not only assumed an excessively high load factor, but has failed entirely to allow for the standby or emergency equipment needed to give continuity of service during peak load hours.

We have made no reference to the well-known fact that publicly owned plants are rarely operated with as high a degree of economy as are privately owned plants. Taking this into consideration, it is apparent that the state of Texas has nothing to gain by engaging in the production of cement, even though, as Prof. Nagle estimates, 1,000,000 bbl. will be annually used in road construction. Prof. Nagle says at the close of his paper:

"The principal effect of a state owned plant would, however, lie in its wholesome tendency to stabilize market prices and reduce fluctuations which, when excessive, are hurtful to both producer and consumer.

"I leave it to each of you to decide whether or not, in your opinion, the state should own and operate a cement plant of its own and hope that what has been said may aid you in reaching a conclusion."

State owned cement plants, if built to regulate prices, would probably result in the extermination of privately owned plants, and thereafter the cost of cement, would be "regulated" by politicians and their appointees.—[Engineering & Contracting.]

Industrial Relations

By J. K. Jensen*

In these days of reconstruction, few questions are of greater importance than the relation of capital and labor. One of the leading business men of the country has rightly said that the term capital and labor is an unfortunate one because it immediately brings to mind the antagonism which has existed between the two classes down through the ages. He suggests as a substitute, directors and workers. In this brief paper it is my purpose to treat the subject in the sense of the latter term, which accords to the worker a place in industry at the side of the director.

There is in my opinion but one method which will effectually solve the troublesome and destructive warfare between employers and employes which is current today throughout the whole world. And that is a wholesome application of the golden rule. So long as the directing power of industry is actuated by selfish motives it must of necessity think and talk and act against the true interests of the workers. So long as the workers are actuated by selfish motives, they must of necessity think and act against the true interests of their employer. If both parties will apply the golden rule and begin to consult the interests and rights of the other party, the whole difficulty will be in process of solution.

This is not wanton theorizing. There is abundant evidence in American industrial life today which shows that wherever men have been actuated by a broad spirit of fair play industrial strife with all its attendant evils have vanished into thin air.

Inasmuch as the directors of industry are supposedly occupying higher ground in general culture and education than are the workers, it is but reasonable to expect them to take the initiative in bringing about a cessation of the destructive warfare between the two forces in industry. One thing is absolutely essential before anything worth while can be accomplished, namely that the employer, in approaching this whole question, does it, not because it is good business, not because it will pay him well to assume a different attitude toward his employes, but simply because it is right and the men are entitled to it. Let it be done because simple justice demands it. If this is the basis of his thought and action, he will be able to solve the problem. If he is actuated by selfish motives and governed by expediency, he will fail miserably. The workers are quick to distinguish between sham and reality and the present day is no time to trifle with the rights of others.

Why is it that you have a greater interest in your business than your wage earners? Why is it that you do not keep track of the number of hours that you give to your business? Simply because there is a direct relation between your efforts and your compensation for these efforts. The man working for you for a daily wage is no different than you. To use the words of Shylick, "Hath he not eyes? Hath he not hands, organs, dimensions, senses, affections, passions? Fed with the same food, hurt with the same weapons, subject to the same diseases, healed by the same means, warmed and cooled by the same winter and summer? If you prick him he bleeds. If you tickle him, does he not laugh? If you poison him, does he not die? And if you wrong him, shall he not revenge?" Now, give this man, who is like unto yourself, the same relation to his work that you have to yours, and he will respond in exactly the same manner. Let there be the same relation between his efforts and the compensation for his efforts that you claim for yourself and you will have solved your labor difficulties.

I am fully aware of the seriousness of the whole problem of profit sharing and of the many ramifications of the subject. I think it unwise to rush into it and establish profit sharing plans and schemes without first taking plenty of time to think them over and feel one's way. To my mind, the chief thing is the mental attitude. If that is right, the method is secondary. Experience and time will solve that.

There are certain fundamental principles involved in any profit sharing plan that is to live.

First: The first object in any industry before any thought can be given to profit sharing, is to get in an amount annually sufficient to cover operating expenses, depreciation and a fair return on honest investment.

Second: Profits above this should be divided between capital and labor.

Third: These profits should be left in the business. The directors' share should be carried to surplus and the workers' share should be distributed to them in some form of security representing an interest in the business.

If a program similar to this is followed, you will not only have profit sharing, but you will have profit saving, and the former is of little account without the latter.

In our case we announced to our men that our board of directors had passed a resolution, inaugurating profit sharing, based on the conviction that the worker who gives loyal and efficient service is entitled to share in the profits which are partly derived from that service. We made it clear at the start that we had no finished plan, but that as time went on, we hoped to work out a plan which would suit our particular business. The first definite result of our board's action was to announce to the men that every man who had been in the company's employ for at least six months, was entitled to one week's vacation each year with full pay. The second step was that each month a certain amount of the company's earnings would be divided among all employes, each man receiving a certain percentage of his monthly wages. This percentage is at present more or less arbitrary and we fully realize that this is but an imperfect step toward the goal which we have set.

Once a month we gather all the company's employes and hand each man his envelope containing his percentage of the earnings. At these meetings we acquaint the men with the production records of each plant during the preceding month. We urge every one to offer suggestions of whatever nature and if they have any value they are followed. These meetings bring directors and workers into closer touch with each other, which in itself is of great value. On the whole, I believe it is safe to say that our men have a new interest in their work, they are beginning to think of their own efforts in relation to their individual incomes. The turnover has fallen off very materially, which is of the most vital importance to the successful operation of any business.

I am firmly of the opinion that a plan as I have outlined will accomplish three things.

1. It will give the worker what is justly his.
2. It will end all labor trouble.
3. It will increase efficiency and bring about greater earnings.

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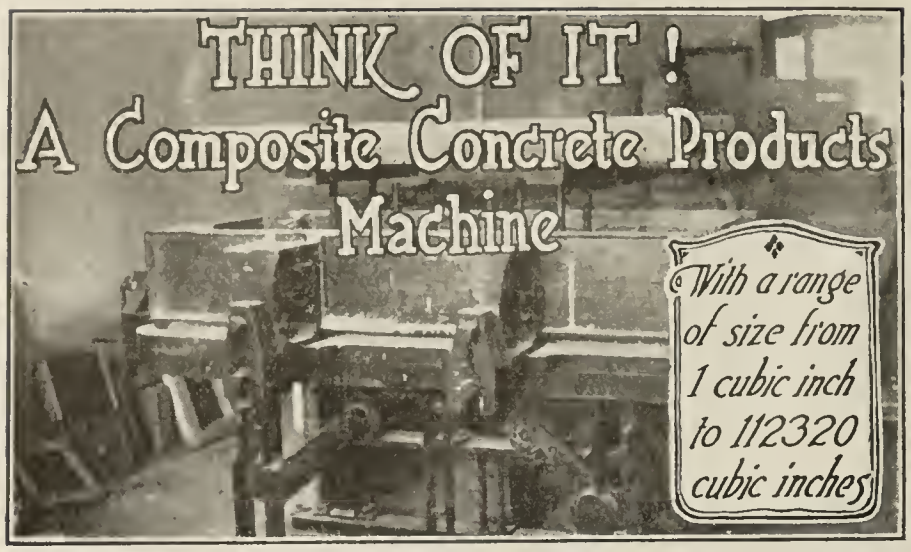
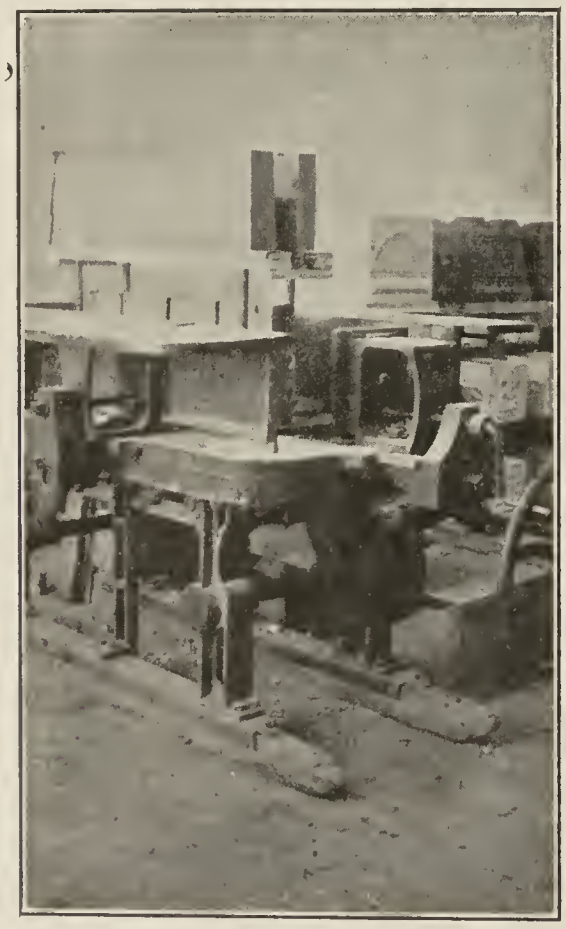
*President, Janesville Sand & Gravel Co., Janesville, Wis.



By J. T. Wisner, President
Standard Concrete Machinery Company
New York City

Standardization is the cry today in all industries. It has become necessary to replace labor as far as possible with mechanical appliances. The successful manufacturers are successful because they maintain their methods and machinery in the highest state of efficiency and in turn these factors directly affect the morale of the employees. It is natural for both men and women employees to enjoy their tasks if they realize that the best possible results are being obtained with the expenditure of the least amount of energy. And this is just what standardization of methods and development of machinery is doing for them. Among manufacturers it has become pretty well understood that the most important factors and the items which deserve their most critical and energetic



Double Wall Building Unit Being Ejected from Machine

thought and action are first, co-ordination of effort in the manufacturing processes; second, the use of the most up to date machinery, and third, the uplift of the morale of their organization. These are the factors which should be developed. The existence or non-existence of these conditions may spell either success or failure.

The writer has long been interested in and made a study of the manufacture of concrete products such as block, brick, building tile, ornamental garden furniture, ornamental wall panels, lintels, building trim, cast stone, etc., and it was evident from the experience secured in the manufacture of these products that there existed a wide field for the development and improvement of this industry.

In making a complete analysis of the concrete product business, the following conclusions were drawn:

1—The same raw materials could be used for all the different units—Portland Cement, sand and stone.

2—The method of transporting from the machine to the curing room and from the curing room to the stock pile required the same equipment.

With these facts in mind and knowing that a different type machine was needed for each unit, it occurred to the writer that a machine should be developed which would be adjustable and sufficiently flexible so that a great many concrete products could be manufactured by making use of one machine only. Realizing that a composite machine of this type would result in an enormous financial saving to the concrete products manufacturer (reducing the cost of machinery installation probably 90 per cent), the writer decided to devote all of his time to experimenting, and a satisfactory machine has finally been

Close-up View of 2-foot Square Flower Box

produced. Nearly all of the commonly used concrete products can be manufactured with this machine.

One of the illustrations on this page shows a machine in use for making hollow space wall blocks. The weight of the machine is 2,000 pounds. It covers a floor space of 4 by 7 feet and the side and end plates are adjustable so that the range in size of the product is from one inch by one inch by one inch to 30 inches by 48 inches by 78

Flower Box Being Elevated from Machine

View Showing the Process of Elevating the Finished Product

inches. Therefore, any combination of dimensions can be obtained and the products can either be cast solid or hollow and the face plain or decorated.

In order to bring out to the reader more forcibly the speed of manufacture, the writer feels that it would be interesting to follow through all of the operations which are necessary to make one of the products—the decorated concrete flower box.

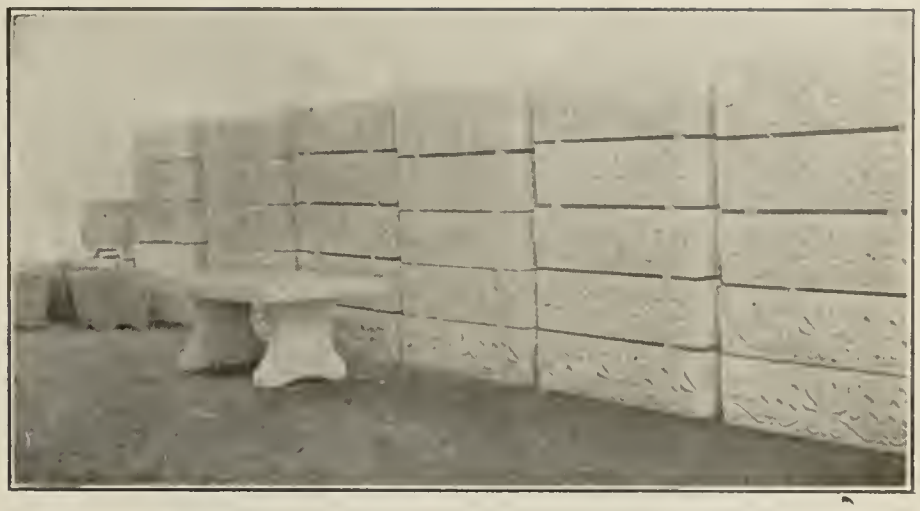
The plates are first adjusted to the required dimensions which are 4 feet long by 14 inches wide and 18 inches high. The inside form is then placed. This form is made of light gauge metal and is left in place until the product is cured, which eliminates cracks often caused by handling. The concrete mixture consists of one part of cement, two parts of marble dust and two parts of clean, well graded sand. A mechanical mixer is used and only sufficient water is added to produce a mixture

The Product as it Appears When Completed by Machine

of uniform consistency. The mixture is next placed in the forms and tamped. The unit is reinforced with a light wire mesh in the bottom and 1-16 inch round rods in the ends and sides. After the product has been moulded it is automatically ejected, and transported to the curing room. The output of this machine is ten flower boxes per hour using a total force of two men. These men operate the concrete mixer and the product machine, and also convey the products to the curing room. The writer estimates that the capacity would be increased to twenty boxes per hour by using a power tamper and an automatic conveyor.

This short article does not permit explaining the detailed manufacture of each product. The capacity for other concrete products can be estimated by carefully studying the above description. When casting smaller units the entire area of the machine table can be utilized.

There has never been a greater demand for concrete products and the reasons for this increased demand are manifold. What building materials are replaced by con-



Ready for Shipment—the Finished Product. Note the Garden Seat

crete products? Clay brick, clay building tile, cut stone, building stone, etc. The acute shortage of coal has increased the cost of clay brick and clay building tile and the high cost of labor has affected the cost of cut stone and building stone to such an extent that concrete products are now on a competitive basis. This condition of affairs will undoubtedly prevail for many years and the opportunity for the concrete product manufacturer has apparently arrived.

One of the Jobs on Which Standard Concrete Products Have Been Used—The High School at Ridgewood, N. J.

The Preparation of Sand and Gravel

A new publication has just been issued by the Link-Belt Company covering the subject of plants for washing sand and gravel. It is a 96-page book illustrated with many photographs of completely equipped plants throughout the country.

This book will give the reader a glimpse of the extensive activities of the Link-Belt Company in the sand and gravel field.

Inasmuch as the Link-Belt Company are pioneer builders of elevating and conveying machinery, in adapting it to the handling of sand and gravel, it makes this book of unusual interest to the trade.

The book will be sent to all interested parties upon application to the Link-Belt Company of Philadelphia, Chicago, or any branch of the company.

Beautifying the Landscape With Ornamental Concrete

The Riverbank Studios of Geneva, Illinois, Have Obtained Wonderful Results by Specializing in Concrete Products

Attractive concrete objects are today taking the place of those formerly made of other materials. Columns, balustrades, benches and vases may be made of beautifully molded concrete. The development of the use of ornamental concrete is dependent upon skillful workmanship, capital and proper publicity. Mediocre products must not be tolerated and artistic perception is necessary.

The Memorial of Concrete

Of particular interest in this connection is the work turned out by the Riverbank Studios at Geneva, Ill. Mr. Sylvestri, with many years experience, is in charge of the work. Numerous handsome objects of concrete are produced, such as columns, gate posts, benches, vases and objects modeled from real life. The work is wonderfully well executed and a high degree of realism obtained.

The Ornamental Fence Post

The customary mixtures are used; molds are of Plaster of Paris or glue. The work is handled, in general, according to the usual procedure until after removal from the mold. The object is then sculptured and this treatment serves to bring out the beauty of materials composing the concrete and adds wonderfully to the appearance of the object. This is especially true in the case of subjects taken from life. Note for example, the life-like appearance of the dog, and how even the muscles stand out. Such effects could not be obtained without treatment of the object with the chisel after removal from the mold.

In some of the work gray cement and ordinary sand are used. In other classes of concrete white cement and white sand or various colored marbles and granites are employed. The work shows the skill of a genius and is a good example of what can be done in ornamental concrete.

Various Examples of Ornamental Concrete Products by The Riverbank Studios

Lime and Fire Protection

A report by the National Board of Fire Underwriters on the recent fire in the brick and reinforced concrete warehouse of the Imperial Tobacco Company, of Norfolk, Va., which resulted in a total loss, has a very direct bearing on the use of lime in concrete. Among other faults the quality of the concrete was poor, the mixing was carelessly done, the placing of reinforcement was faulty, and its PROTECTION WAS INEFFICIENT.

Any one who has seen the complicated mats of steel bars which are laid in the bottom of concrete beams will appreciate how difficult it is to insure that the concrete will perfectly surround and enclose each bar, but that it should, is vitally necessary in order that the intense heat of a fire may be kept as long as possible away from the steel which, by its quick and extreme expansion, would burst the concrete and destroy the building. Ordinarily large amounts of water are added to concrete to increase its flowability and aid in complete filling of the forms, but this water easily separates from the rest of the batch forming pools at the most unexpected points in place of the concrete which should occupy the space. Recent inspection of a new concrete building revealed that in one-third of the beams the steel rods were visible after the forms were removed. It is impossible to repair such a condition, and the building is permanently rendered less safe.

Hydrated lime added in the recommended proportions, however, gives the necessary plasticity and ease of flow through chutes, around steel reinforcement, in complicated forms with an actual reduction in the tendency to segregation, smoother surfaces, lighter color and no measureable decrease of strength either in compression or in bending, while its alkalinity inhibits rusting of the steel.—National Lime Association "Bulletin."

Concrete Storage Tanks

By Robert Seth Lindstrom*

The use of concrete as a material for the construction of tanks for the storage of liquids and fluids such as water, oils and products having a flowing nature, is ever increasing and replacing wood, steel and metal tanks, due to the fact that concrete as a structural material has long since passed the state of experiment and is now universally adopted as one of the leading structural materials.

For structural purposes, concrete, both plain and reinforced, has by time proven to be a non-detiorating and wearproof material and so generally understood. The reason for concrete as a tank construction material substitute for wood, steel and metal is that wooden tanks depend on hoops or bands holding the staves together and tight, while the wood itself is subject to swelling, shrinking and rotting. Therefore, the life of a wood tank is limited to a period of a few years. The steel and metal tank life depends upon non-deterioration by constant painting and coating, both inside and outside. Nevertheless, climatic changes cause expansion and contraction, which exposes the metal to oxidation, which is hastened by sweating, freezing and eating into the metal which will weaken the strength of the tank.

The materials entering into the construction of concrete tanks are cement, sand and aggregate mixed with water, together with structural reinforcement bedded into the concrete. Therefore, it is essential that these materials are selected for quality and grading that will produce a water and oilproof finished concrete tank.

The subject of waterproofing and oilproofing cement and concrete is very complex and may be accepted as a basis of wide divergence of opinions among chemists and others who have made exhaustive studies of cement and concrete waterproofing. Therefore, this branch of concrete tank construction requires the most careful consideration, especially in the field where the human element enters into the proportioning, mixing and placing of the concrete into the forms or moulds.

The term waterproofing, generally speaking, is the method employed for rendering concrete nonporous and dense, which divides itself into three divisions: the integral method, the membrane method and the surface coating method.

For the subject of this topic we will consider the integral method or the absence of voids by selecting materials that will mix and create a density in the finished concrete tank that will be uniformly distributed throughout the walls and bottom of the tank. Therefore, it will become necessary to select only such materials as will guarantee good results, such as the quality and kind of cement, sand and aggregate and water to use.

Cement: The cement should be genuine Portland brand ground to a fineness of 95 on a 200 mesh sieve. This quality of cement is called a "reground cement," which means passing through two stages of grinding until the cement has the fineness of talcum powder, thereby obtaining more collodial efficiency, waterproofing value or cement glue than is obtained by standard specifications for fineness of Portland cement.

The calcareous matter or particles which do not pass through a 200 mesh sieve are incapable of complete crystallization and, therefore, valueless as a cementing material. The cement attacks the silica of the sand and aggregates and crystallizes into one solid mass in the process of crystallization, the finer the cement the less voids will appear in the completed mass or material called concrete.

To obtain the fineness of 95 on a 200 mesh sieve, such as is obtained by the Advance Waterproof Cement Co., they use a patented and scientific process of regrinding true and genuine tested Portland cement by means of massive special machinery designed for that particular purpose, thereby yielding up for cementicious and gripping purposes the full 100 per cent of the colloids that pure Portland cement contains.

The cement used for tank construction should be fresh, new cement, as recent researches show that storage of cement where same is subjected to atmospheric changes create marked deterioration in the strength of the cement, due to absorption of atmospheric moisture causing a partial hydration which reduces the early strength of the concrete and prolongs the time of setting. These researches and tests were made on standard Portland cement which showed the following losses from the original strength. Deterioration in strength with storage of Portland cement from three months to two years' time.

Three months storage in shed, 80 per cent of original strength.

Six months storage in shed, 70 per cent of original strength.

One year storage in shed, 61 per cent of original strength.

Two years storage in shed, 40 per cent of original strength.

The cement giving the bond and final strength to the concrete should, therefore, be fresh and properly stored in a moistproof place.

The strength of concrete increases with the fineness of a given lot of cement for all mixes, consistencies, gradings of aggregate and ages of concrete.

Sand: The important characteristics of sand for use in concrete are durability, cleanliness and grading. By durability is meant sound, non-deteriorating particles of beads of grade known as torpedo sand, which is screened from gravel.

Cleanliness means free from vegetable or organic matter and grading is the sizes of particles having a certain percentage of coarse and fine grains, sharpness of sand is not absolutely necessary, too fine sand, even if free from vegetable and organic matter, should not be used. It makes a weaker concrete and requires more cement and a larger proportion of water. "Run of bank" gravel should never be used. It should first be screened and correctly proportioned to determine the cleanliness of sand. The Colorimetric Test as a very practical and easy field test.

Method for Field Test: The field test consists of shaking the sand thoroughly in a dilute solution of sodium hydroxide (NaOH) and observing the resultant color after the mixture has been allowed to stand for a few hours. Fill a 12-ounce graduated prescription bottle to the 4½-ounce mark with the sand to be tested. Add a 3 per cent solution of sodium hydroxide until the volume of the sand and solution, after shaking, amounts to 7 ounces. Shake thoroughly and let stand for twenty-four hours. Observe the color of the clear liquid above the sand. A good idea of the quality of the sand can be formed earlier than twenty-four hours, although this period is believed to give best results.

If the solution resulting from this treatment is col-

*General manager, Advance Waterproofing Cement Co., Chicago.

orless, or has a light yellowish color, the sand may be considered satisfactory in so far as organic impurities are concerned. On the other hand, if a dark-colored solution is produced, the sand should not be used in high-grade work.

Aggregate: The aggregate may be of gravel, crushed limestone or other local aggregates equal to gravel or crushed limestone. If gravel is used, it should be graded from size that will pass through a ¾-inch ring down to size of sand used, and subjected to the same tests as to durability, cleanliness and grades as above suggested for the sand.

If crushed limestone is used for aggregate it should be graded from ¾ inch to ¼ inch in sizes and free from dust, loam and foreign matter, washed clean. Crushed limestone for concrete tank construction has been found to produce a more fire-resistive concrete than when gravel has been used for the aggregate.

Proportion of Mix: For concrete tank construction the following proportions are recommended: One cubic foot reground cement, two cubic feet sand and three cubic feet of aggregate.

Water: The water for mixing concrete should be pure and free from oil, acid, alkali or organic matter and sufficient amount of water used on the mix to bring the mix into a consistency of pouring into forms.

Mixing: The concrete should be mixed by machine in a batch mixer of a type that will thoroughly mix cement, sand and aggregate into a uniform batch.

Pouring and Tamping: The batch should be poured into forms or moulds immediately after being properly mixed, then thoroughly spaded and tamped into place.

Reinforcement. The reinforcement should be so placed that the concrete will readily pour and entirely imbed the reinforcement steel as the tightness of the tank depends upon the dense coating around the steel. The steel should not be painted or coated, but clean, as the adhesion of the concrete to the steel depends upon the cleanliness of the steel.

Plaster Coat. After the forms have been removed, if any honeycombing or defect appears, the loose and porous portion should be removed and a coat of plaster filling all openings should be done while the tank is still green. This plaster coating should be of a mix consisting of one cubic foot of reground cement and two cubic feet of sand troweled to a smooth even finish.

Wetting Down. The tank, if exposed to heat or hot weather, should be wetted down while in the period of setting to prevent crazing of surface exposed to elements.

Expansion and Contraction. Expansion and contraction in concrete construction is caused by the expansion and contraction of the steel reinforcement and not in the concrete itself, as the concrete in the process of drying out and hardening naturally causes some shrinkage by the evaporation of the water and suction in the bonding and crystallization of cement with the sand and aggregate.

The term expansion applied to concrete is not correctly used, as expansion or breakage of bond in concrete is caused by the porousness of the concrete mix admitting moisture and water, which freezes and thaws causing expansion of the ice formed in the voids or minute opening in the concrete, also by the porousness of the concrete subjects the imbedded steel reinforcement to climatic changes and conditions.

Therefore, when reground cement is used with proper kinds of sand and aggregate, coupled with good workmanship, the density throughout the completed mix will prevent moisture and climatic condition from penetrating through the finished dense concrete and thereby practically do away with expansion and contraction of the steel reinforcement.

Pipe Openings. The weakest part of any tank construction material is at the openings left for filling and draining when metal pipes are used for this purpose, due to the expansion and contraction of the pipes, also the jar and friction caused by making pipe connections. Therefore, it is of great importance that the sleeve passing through the wall or floor of the tank is securely anchored into the concrete, and this can be accomplished by using a flange sleeve with prongs or long teeth in the center and extending into the concrete, the inner portion of the flange threaded its entire length, and a temporary screw cap for preventing the concrete coming in contact with the threaded portion of the sleeve. After the tank has set and dried out, remove the screw caps and insert an inner threaded pipe threaded the entire length, letting inner and outer ends project enough for the regular pipe connections.

Manufacture of Canvas Into Its Several Products

It is well to know the name and address of a concern from which any canvas product can be secured. This applies to bales or rolls of canvas, to tents, awnings, paulins and covers of every description, in which the factor represents the very best mills in the country and has built up a reputation for integrity.

This is the claim of the United States Tent & Awning Co., 217 North Desplaines street, Chicago, a claim backed by the record of the house of living up to its commitments. This is better understood, perhaps, when the men identified with the institution are known. They include Edward Litsinger, Edward P. Neumann and S. J. Pilkinton.

The company specializes in several features of the canvas trade. A great deal of business is done with the railroads who buy largely by bale and roll. Shipment can be made direct from the stock of the company, or if more advantageous, shipment will be made from one of the mills the company represents.

The company's motto, "Anything in Canvas," is made good by its performance. Covers of every description for every purpose are manufactured and sold to any one needing them. Covers for wagons and trucks, for example, are made with sides, but the ordinary cover is a flat piece of canvas, of suitable size, and the size may be anything within reason.

A rather unique feature of the business of the United States Tent & Awning Co. is the manufacture and sale of second-hand canvas covers of every size and weight, which are furnished to general contractors and road contractors for covering freshly cast concrete, materials and for such other purposes as require covers. The canvas that goes into these covers is thoroughly tested and dried before being stored away and there is no depreciation in its quality from long storage under cover.

With the very best materials at its command and the very best grade of highly skilled union tent makers to make its products, the company turns out the highest type of canvas products procurable. Any article made of canvas is made by the company and its facilities are such that very prompt shipment can be guaranteed. A large stock of standard size covers and tents is carried and anything special can be turned out on short notice.

The company also carries a stock of Preservo, which is acknowledged to be the best water and mold proof preservative, and if properly used it will greatly prolong the life of canvas.

A Revelation in the Production of Concrete Building Stone

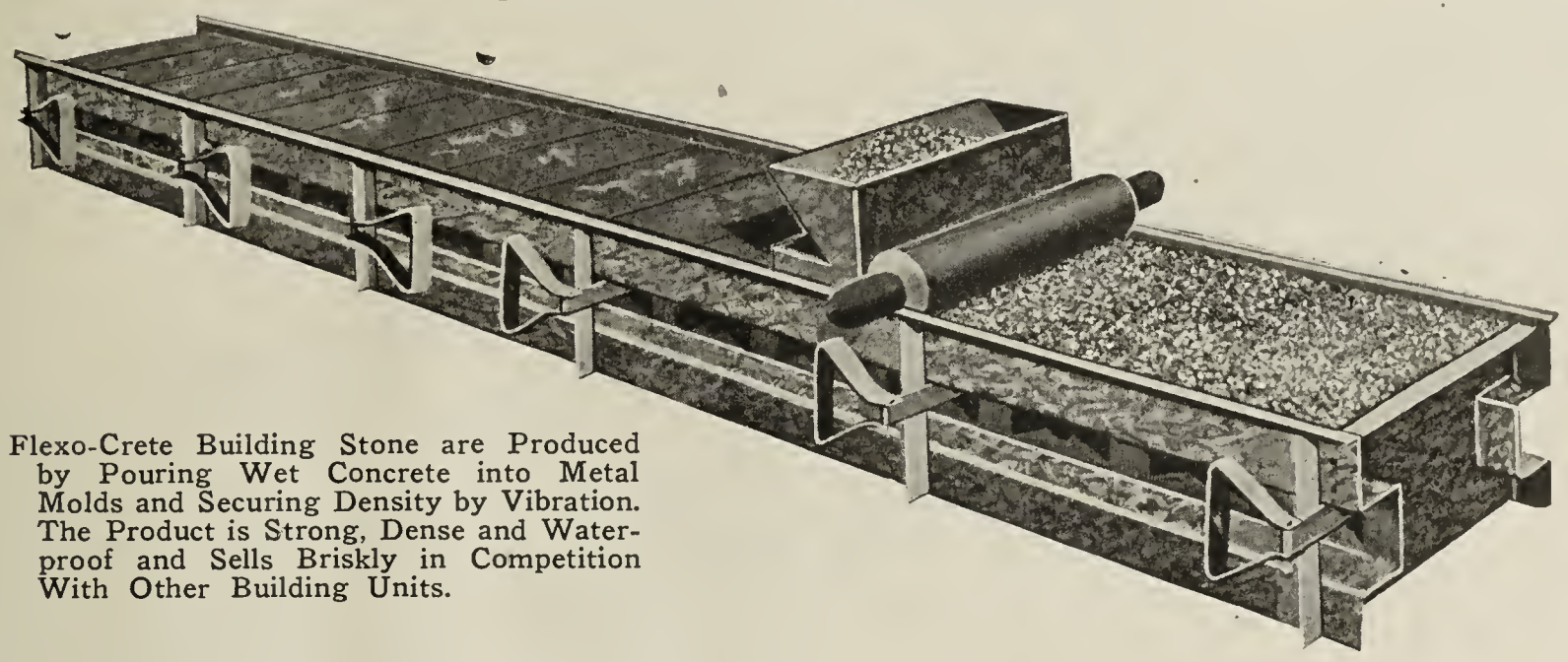
"Realizing the growing demand for a practical mould for producing poured concrete stone, in lieu of the cumbersome cast iron and boiler plat moulds on the market, we have designed what we style our Flexo Moulds, made throughout of Galvanized Sheet Steel. They will not rust, not corrode, nor stick to the wet mortar, but produce a stone with faces as smooth as pressed brick," writes the Flexo-Concrete Mould Company.

Flexo Moulds are made in two styles, a fifteen-unit wall type, as illustrated on this page, and the four unit corner type. The fifteen-unit mould is composed of but five distinct parts, viz.: two side rails, fourteen intermediate cores, two end or half cores, fifteen palletts and six clamps. These parts being interchangeable, the entire mould can be assembled and secured with the clamps in three minutes. The entire fifteen-unit moulds weigh but a trifle over one hundred pounds, but one sack of Portland Cement, two parts sand and four parts aggregate poured in this mould produces fifteen 8x8x16 Concrete Building Stone, with a minimum of labor.

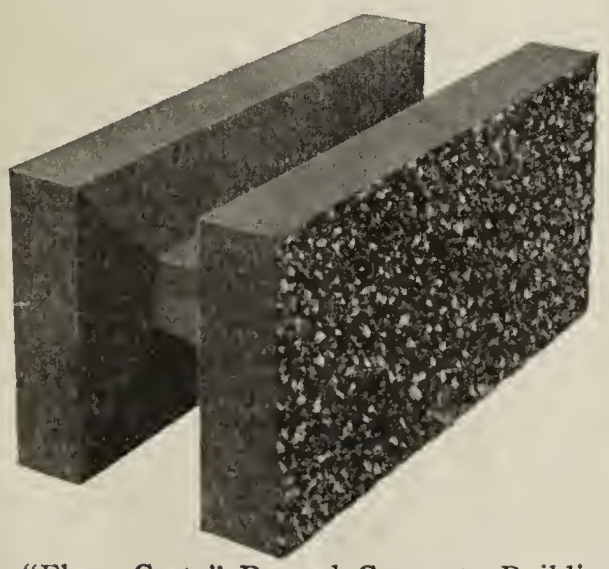
With this equipment is included a very novel yet practical process of making faced stones. By the use of a spreader riding on the top of the side rails to evenly distribute any facing desired and a large roller following the spreader troweling the facing into the wet mortar, producing a beautiful face with all the lights and shadows and the permanency of natural stone.

Flexo Moulds are so constructed that the clamps and side rails may be removed after the stone has stood a few hours and with an extra set of cores and palletts the capacity of each unit is doubled at a very nominal additional charge.

The entire equipment is priced at a very nominal figure and it will pay interested parties to communicate with the Flexo Concrete Mould Company, 216 Masonic Temple, Cedar Rapids, Ia.



Flexo-Crete Building Stone are Produced by Pouring Wet Concrete into Metal Molds and Securing Density by Vibration. The Product is Strong, Dense and Waterproof and Sells Briskly in Competition With Other Building Units.



"Flexo-Crete" Poured Concrete Building Stone

WORDS OF COMMENDATION

Scott City, Kans.

The blocks your molds make are meeting with great favor here, and men who have had large experience with concrete blocks say they are by far the best blocks they have ever seen. I believe it will grow into quite a business here as people become more acquainted with them. Please rush may last order for molds.

E. E. COFFIN.

Corvallis, Ore.

We make tamped blocks as well as those made in your molds, but sell three or four times as many of the Poured Blocks as Tamped Blocks, and according to our experience the Poured blocks can be made from 20% to 25% cheaper than the others. Our stock of Poured Blocks is completely gone and we are behind several thousand blocks in our orders. We let our customers do their own choosing.

BUILDERS' SUPPLY CO.

Cedar Rapids, Iowa.

We have been agreeably surprised with the ease with which the forms go together and can be assembled, and also the manner in which we are able to release the forms.—As a whole we have found the equipment to be very satisfactory.

BUILDERS' MATERIAL CO.

Williams Pulverizers

Two Williams hammer mills are used in the plant of the Plymouth Gypsum Co., Fort Dodge, Ia., for pulverizing the gypsum rock and they are said to give entire satisfaction. The approximate fineness attained for the dried material is about 60 per cent through 100-mesh.

The Plymouth Gypsum Co. is now completing a new gypsum mill which will be known as the Iowana Gypsum Products Co. As in the old plant, two Williams mills are used for pulverizing, giving the same desired fineness.

Crushing Stone for Railroad Ballast

The production of crushed stone has come to be one of the important industries of the country destined to even greater importance as the demand increases for railroad ballast and road and concrete material. The firm of L. W. Lewis' Sons of Emporia, Kansas, alone has ten crushing plants in operation, most of them at points along the Santa Fe railroad.

The visitor at Garnett, Kansas, will find one of these Lewis plants two or three miles outside the city, which is being operated in charge of R. C. Jacobs.

Stone is taken from the open quarry by steamshovel. Until the price of feed climbed to so dizzy a height, dump wagons were used in hauling. Recently 1,200 feet of Western industrial track and switchers and however, until the locomotive dinkeys could be put in operation.

An Austin gyrating rock crusher, the largest size, does the business at the plant. The crusher has been

Hauling Stone to a Crusher by Team. The Horses Since have been Replaced by Dinky Locomotives

Shovel Loading 1½-yard Dump Cars. Lewis Quarry, Garnett, Kansas

Western 1½-yard side dump cars were installed for the purpose. At the time the accompanying photographs were taken in April these cars were being hauled by team. This was a temporary expedient, set up along the Santa Fe track, with a sidetrack leading under the bins. But little of this crushed stone is sold for commercial purposes. The Santa Fe Railroad takes practically the entire output for ballast.

Dumping Stone into Austin Gyratory Crusher at Garnett, Kansas

L. W. Lewis' Sons' Crushing Plant, Garnett, Kansas, of Which the Opposite Scene is a Detail

A Universal Belt—Adaptable Either to Driving Conveying or Elevating

The Rexall belt, manufactured by the Imperial Belting Co., Chicago, is designed primarily for general conveying and elevating where large quantities of abrasive materials have to be transported. Its rugged construction and wear resisting surface enable it to carry a large variety of substances, among which may be mentioned crushed stone. ore, clay, sand and gravel, cement, coal, coke, etc.

In order for a belt to function properly as a conveyor it must be sufficiently flexible to conform easily to the troughing idlers or rollers. The compound with which Rexall is saturated is a carefully proportioned mixture of oils and gums, which is put into the belt in such a way that each and every fiber is completely saturated and all voids between the fibers completely filled. This compound is then "set" right in the body of the belt, producing a very flexible belt and one which troughs easily but which, at the same time, has remarkable wearing qualities.

The duck used in its construction is made from selected cotton and each roll of fabric is tested before it is put into the belt. The fabric used is difficult to manufacture and owing to the rigid specifications and inspection, costs more than the customary "belting duck," but by adhering to exact specifications a product is produced of unusual uniformity, and which possesses remarkable strength.

A 30-inch, 8-ply Rexall Belt Handling Sand and Gravel

As a conveyor belt wears, it is absolutely necessary that ply separation must not take place. Some belts wear very well until the outer ply or envelope is worn through, but then deteriorate very rapidly. The core or inside of each Rexall belt is stitched together with rows of stitching absolutely independent of the visible or outside stitching. By this means ply separation is prevented. In fact, many Rexall belts used for several seasons, handling very gritty materials, have worn down in the center through three or more plies, without the slightest tendency for the remainder of the belt to separate.

The high tensile strength of the Rexall belt, combined with toughness and flexibility, eliminates "fastener trouble." Crescent belt fasteners when properly applied, will hold a Rexall belt together, throughout its life on the pulleys.

The same qualities, which make Rexall popular for conveyor work, also make it a very desirable belt for bucket elevator work and many Rexall belts are operating successfully in this class of service. Its rugged construction absolutely prevents the bucket bolts pulling through the belt and its high tensile strength and natural elasticity permit it to take care of the sudden shocks and strains encountered in work of this nature.

For driving conveyors and elevators, screens, crushers, ore mills, etc., Rexall works perfectly. Its wear-resisting construction fits it admirably to handle heavy-duty drives where abrasive dust is present in the atmosphere and where belts are run out of doors or at best under scant cover. For all other driving conditions the company recommends the Ibeco belt; a belt especially designed to transmit power under the usual conditions in plant and shop work.

Rubber Conveyor Belts

The question of the proper compound for the cover of a conveyor belt is determined entirely by the character of the load to be carried. The diversity of loads that a rubber belt can carry has caused this means of handling material to be adopted in an ever-increasing number of industries. Its use is given added impetus by the present scarcity and high cost of hand labor, and results in the lowest possible handling-cost per ton or other unit, says Theo. M. Pockman, United States Rubber Co.

Conveyor belts today handle coal, coke, ore, gravel, sand, crushed stone, grain, sugar beets, and hundreds of other products in bulk, in process or in finished form.

The chief factors determining the construction of a conveyor belt beside character of the load are the operating speed, the angle at which the belt operates, the arrangement and number of idlers, the direction of the load, and the position of the drive.

Bucket elevator belts are used where the angle of inclination is too great for a conveyor belt and also where the material must be lifted vertically.

Rubber transmission belting is a standard product whose construction of plies of duck and rubber permits of any special make-up for any conditions. It is built up of the necessary number of plies of duck to give the requisite tensile strength and these plies are impregnated with the proper rubber compound or "friction" which causes the plies to cling tenaciously together after vulcanization. The word "friction" is a rubber trade term indicating that the compound is "frictioned" into the duck between heavy calender rolls, one turning at a faster rate than the other to squeeze the rubber into the interstices of the weave. Unless a belt is given an outside cover of rubber to withstand extreme moisture it is a "friction surface" belt.

Certain severe operating conditions need a stitched belt as an additional precaution against "bootlegging" or separation of the plies. The proper application of transmission belting naturally calls for the widest experience in field conditions.

Effect of Sea Water on Concrete Construction

At present, it may be said with some certainty that the observed defects are entirely due to the corrosion of the steel reinforcement, owing to the penetration of water through the concrete covering. Insufficient amount of concrete easily suggests itself as the cause of the penetration, but this simple explanation does not cover all the observed facts connected with the corrosion of the steel. In the majority of cases corrosion has been noticed to be first observable about the level of high water neap tides. At Southampton, Mr. Wentworth Shields distinctly states that the rust action takes place only above high water level: "Below high water neap tides, where the piles and bracing are kept constantly wetted, they are still quite unaffected, but above that level the piles, bracing and underside of decking have suffered considerably." At Wellington, New Zealand, as again in the Port of London, no serious deterioration was found below high water level. Mr. Cullen, of Brisbane, considers that the action of moist air on the concrete is as effective as that of water. Mr. Kirkpatrick offers an explanation that covers many of the observed facts. He suggests that during the drying of the wet metal, corrosion proceeds rapidly as it is in contact with the air, consequently where the concrete cover is thin and moisture finds its way to the steel in wet weather, one may expect that corrosion will ensue in the periods of fine weather as evaporation continues and cause the concrete to crack. "Below high water moisture will not have time to dry and between the wettings and the steel is protected from those conditions which lead to rapid corrosion."

The signs of deterioration have been well observed, and evidence shows that the first symptom is the appearance of small spots of rust on the face of the concrete. Corrosion next extends in the direction of the reinforcing rods, and cracks can be perceived. Once a crack is started water gains access to the steel, and the effect of corrosion is to force the concrete away from the bars, allowing the entrance of more and more water. No doubt the effects of traffic and the strain of wave action tend to accelerate the opening of the cracks. Mr. Kirpatrick states that the bursting force of the corroding steel is as high as 4,700 lb. per square inch, and he has had under observation at Gravesend a jetty where many of the beams became cracked throughout the whole of their lengths, exposing the bars. In some cases the whole side of the beam became detached.

Evidently the depth of concrete covering is an important factor in securing permanence of structure. Mr. Cullen at Brisbane is prosecuting a series of experiments to determine the most effective thickness, varying the quantity from ½ in. to 2 in. Meanwhile general opinion favors the view that the minimum thickness should not be less than 1½ in. for piles, beams and similar work, while for decking a slightly less thickness might be permitted. Naturally, the obvious benefits that follow from rendering concrete impervious to water has suggested the desirability of applying a coating of some waterproof material, as tar, or ironite, to the surface of the concrete. Gas tar has been tried, but not very successfully, "perhaps because it was applied too late," says one authority. In the case of an oil wharf constantly saturated with oil no signs of corrosion were apparent. More evidence on the value of waterproofing is needed, as its use has not been general or long continued. No doubt regular repetition would be needed as Mr. Hamer, of Auckland, New Zealand, points out.

It is satisfactory to note that no defects in reinforced concrete are attributed to the concrete itself, and equally interesting that few remarks are made upon the composition and character of the aggregate. The inference to be drawn from this silence is that such matters as the mixing, placing and ramming have become systematized, and that the controlling factors in producing reliable concrete are perfectly understood. The contrast with earlier experience is striking, and the committee directs attention to the misgiving with which the engineering world 30 years ago viewed the employment of ordinary concrete in the construction of dock and harbor works. The defects which undermined confidence owed their origin to porosity in the concrete itself and the infiltration of sea water. Wherever sea water can soak into the concrete and subsequently exude, the magnesium salts in the sea water withdraw a portion of the lime of the cement in the form of calcium salts and leave a deposit of magnesia in its place. An example of this action is reported from Scarborough and other places, but the damage generally is not serious. In very cold climates as at Halifax (N. S.) frost may be the cause of injury. In some concrete-in-mass piers, water penetrated the surface of the concrete at the time of high tide. When the tide goes down, the water in the concrete freezes and expands, and upon thawing again with the rising tide, the surface film of concrete falls off in powder. For such temperature effects, water-proofing is apparently the only remedy. Where high-class work is needed the committee recommends the use of concrete in the form of seasoned blocks, made above tide level, and stacked for two months before being set in position in the permanent work. Further, for sea work, they are decidedly in favor of using Portland, rather than Roman, cement, and the use of lias or hydraulic lime in concrete is disapproved.—[From Engineering, London.]

Cleaning Cement Sacks with Blower

A method of cleaning cement sacks which not only reduces the cost of this work, but also has resulted in recovering much cement, is employed at the store yard warehouse of the United Railways of St. Louis. The scheme is described in the Electric Railway Journal.

A No. 5 Buffalo blower is installed overhead with the intake pipe extending down to a point about waist high. The discharge from the blower is piped a short distance along the wall, where it connects to a cyclone separator. A cement sack is put over the mouth of the intake pipe. The suction draws the bag up into the pipe and turns it inside out. The workman then pulls it out and again puts it over the end of the intake, which turns the sack the other way out and sucks the cement from the opposite side. This process leaves the sacks cleaner than it is possible to get them by hand. The cement recovered is deposited in a sack attached to the bottom of the cyclone. By this means from one and one-half to two sacks of cement are recovered per 1,000 sacks cleaned. Two men can clean 2,000 sacks a day, besides sorting, counting and bundling them. The cement recovered makes a credit to the cost of handling of about $2.50 a day. The use of this machine makes the bag cleaning not a particularly undesirable job, and furthermore largely overcomes the spreading of cement dust over everything in the warehouse.

Mesh Reinforcement in California Concrete Pavements

On county highway work in California the use of mesh reinforcing in concrete pavements has been rapidly increasing. To date about 300,000 sq. yd. of mesh reinforcing for county road work has been supplied in that state by one firm alone and the demand during the first eight months of this year was for three times the amount supplied last year. In general it is true among county engineers of California that where sufficient funds are available to permit its use there is no discussion as to the desirability of reinforcing, the only question being as to the most suitable kind and weight, its cost and the best method of placing it. In next season's road construction program the counties are planning more extensive use of mesh reinforcing. This means much in California because in that state last year fourteen counties voted a total of $20,604,000 for road bonds. Of this work 50 per cent is now under way and about 90 per cent will be paved.

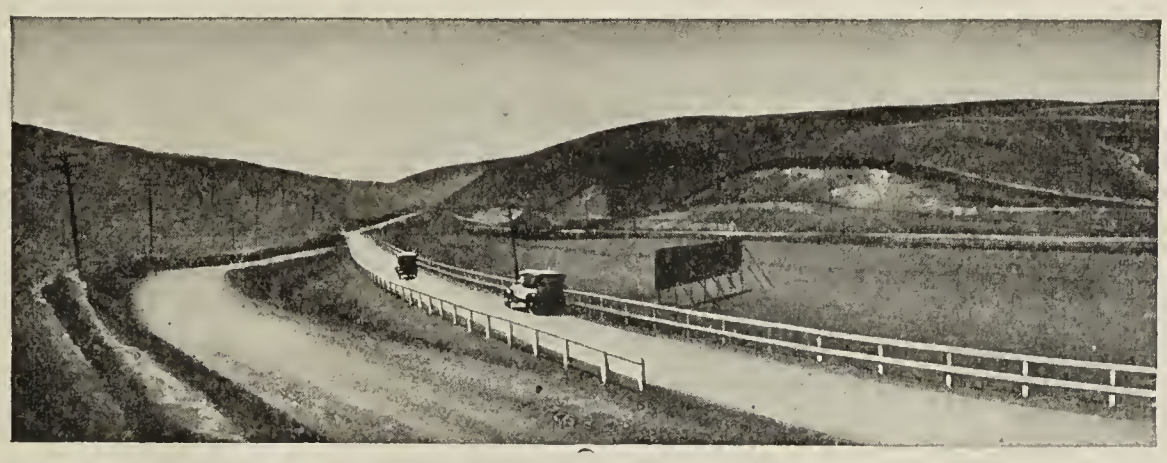
Where mesh is used the amount varies from 22 lb. per 100 sq. ft. as a minimum to 41 lb. as a maximum, the average being about 26½ lb. About 26 or 27 lb. per 100 sq. ft. is believed to be sufficient to prevent longitudinal cracks and control the transverse cracks so that they have no injurious effect. In the method now preferred the fabric is laid with the longitudinal wires at right angles to the center line of the road. By giving the mesh a small lap on each width to insure bond, reinforcement is secured in both directions.

In general, three methods have been used for handling and placing the mesh. In the first, the mesh is placed directly upon the prepared sub-base, the concrete is poured upon it and the mesh is then pulled into the center of the slab with hooks. In the second method the mesh is placed upon sections of pipe laid on the sub-base lengthwise with the road. The pipes serve to keep the mesh in the center of the slab during the process of pouring, after which the pipes are withdrawn. A third plan, known as the two-operation method has not yet been used extensively but has thus far met with considerable success.

In the two-operation method the mesh is shipped to the job in flat sheets cut to the proper length. Mixing operations are then begun and the lower half of the slab is poured for a convenient length (section one). Where a spout mixer is used this first pouring in from the end of the spout. A gate in the middle of the spout is then opened and the space next the mixer (section two) is poured on the sub-base in the same manner. During this second operation the fabric is laid on section one and, without moving the mixer, the top half of section one is poured over the mesh from the outer end of the spout.

The mixer is then advanced a distance equal to the length of a section and while the lower half of section three is being poured from the gate in the middle of the spout, sheets of fabric are laid over the lower half of section two. The gate in the middle of the spout is then closed and the fabric of section two is covered with its top layer of concrete by pouring from the end of the spout. This process is repeated during the remainder of the job, two adjoining sections of half thickness, one at the top and one below being poured from each mixer position.

Advantages claimed for this scheme of placing are: the mesh is kept properly in the center of the slab, reinforcement does not have to be disturbed after it is once in place and pouring operations are interfered with to a very limited extent. This method was used by R. M. Morton, while engineer of the Sacramento County Highway Commission, to whom we are indebted for the following cost data.



California's Permanent Highways are Nationally Famous. This View, Taken in Alameda County, Shows a New Concrete Road. A Curve was Widened and White Railings Provided to Increase Safety of Both Day and Night Transport

On Sacramento County work the mesh used weighed 27 lb. per 100 sq. ft. and cost $1.53 per 100 sq. ft. delivered. Two men per gang were employed to handle and place the reinforcing. When laying 7,500 sq. ft. of pavement per day the cost of hauling and placing the mesh was 35 cents per 100 sq. ft. This cost includes a slight charge against the reinforcement for a slowing up of mixer operations. The total cost of reinforcement in place on this job was therefore $1.88 per 100 sq. ft., making a cost per mile of $1,566 for a 15-ft. roadway.

Lime Makes Central Mixing Plant Possible

An article recently published, entitled "Wet Concrete Hauled Three Miles for Pavement Base," states that the concrete flows freely after half an hour in motor trucks. Hydrated lime facilitates the spreading and tamping. The Union Paving Company, Philadelphia, doing 150,000 square yards of work, say that hydrated lime is added to produce a denser, more plastic mix, as well as to retard slightly the initial set. The lime proportion is 10 to 15 per cent of the cement used, depending on the length of the haul. A stiff consistency is maintained about 5 to 6 per cent of water (by weight) being used in mixing. A bulletin on this subject is in preparation by the National Lime Association, Washington, D. C.

New Motor Drive Kent Continuous Mixer

For Concrete Products Plants

Of considerable interest to cement products manufacturers is the announcement by the Kent Machine Co., Kent, Ohio, builders of the well-known Kent Continuous Mixers, of a new motor-driven machine which they have added to their already complete line of mixers. It is generally known that the Kent Stationary Mixer is pracically the only mixer on the market that was designed especially for use in concrete products plants. In keeping with their policy to supply the cement products manufacturers with the type of mixer that is best suited to their requirements, the Kent Machine Company designed the motor-driven mixer shown in the accompanying illustrations.

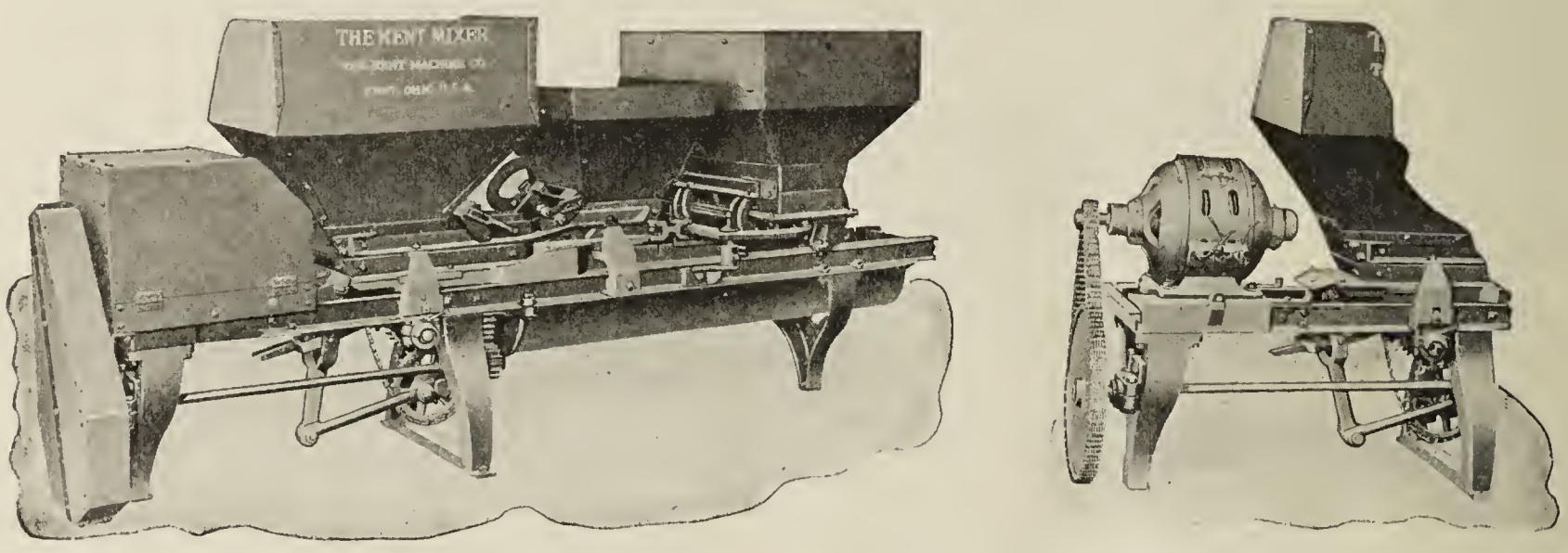
For those who are not familiar with the operations of the Kent Mixer, we will say that it is a continuous type of machine in which all operations except the placing of the materials in the hoppers are entirely automatic. The patented flat plate feeding device on the "Kent" guarantees an accuracy in measuring and proportioning that is not found in any other continuous mixer. There are no agitators in the hoppers on the "Kent" and no pockets in the feeding device to partly fill the adhering materials; neither do they use the old and unreliable "worm" or "screw" type of feed which wear rapidly and vary the feed as they wear.

The material rests on a flat feed plate which has a horizontal motion and at each stroke of this plate a certain amount of each material is automatically deposited in the mixing trough. In this trough there is a long, horizontal shaft on which there is bolted a series of mixing paddles. The blades of these paddles are placed at a slight angle so that they not only mix the materials, but at the same time convey them toward the discharge end of the trough. Careful experiments were made to determine the correct angle at which to place these mixing blades, in order that the materials might not be discharged before being thoroughly and uniformly mixed.

More than half the entire length of the trough is used for the dry mixing of the sand and cement, thus making the dry mix absolutely perfect before the water is added. A spray pipe is provided for wetting the materials and by placing a shut-off cock on the supply pipe, the water may be shut off without disturbing the adjustment of the spray. This is very important, as it insures concrete of uniform consistently, which is absolutely necessary in order to obtain a high quality product.

The output of the "Kent" is easily controlled and can be varied from nothing up to full capacity by merely shifting a lever. This is done without in any way changing the proportions of the mix. By this adjustment it is not necessary to mix more material than can be used almost at once, and everyone knows that the sooner concrete is placed in the molds after being mixed the higher the quality and strength of the product.

The illustrations shows a No. 2 three-hopper mixer with a capacity of 5 cu. yds. per hour, equipped with a 3HP motor and silent chain drive. The motor is rigidly mounted on the frame of the mixer, but an adjustment is provided on the base for tightening the chain when necessary. Knowing the conditions under which a mixer must operate in a concrete products plant, particular care was taken to carefully enclose the motor, chain drive, and sprockets in steel housings to protect them from dust, sand, etc.



View Showing a No. 2 Three Hopper Mixer with a Capacity of 5 Cubic Yards per hour, Equipped with a 3 H.P. Motor and Silent Chain Drive

This mixer, as well as the other sizes built by this company, is furnished with either two or three hoppers, also with direct or alternating current motor to meet the requirements of their customers.

Wrecking Operations

To break up an old stone wall or other masonry, or to knock out a superfluous brick pier without the use of dynamite, slow hand labor is unnecessary. Simply drill a good-sized hole in the wall—making this bottle shaped, with as small an opening as possible. Put in quick lime until this hole is almost full and make a tight-fitting wooden plug that can be driven firmly into the opening. Quickly pour in enough water to slake the lime and drive home the plug.

The expansion of the lime as it slakes will exert a tremendous pressure that will easily break up any ordinary piece of masonry.

News of the Cement Mills

A deed placed on file last week at the probate office, Gadsden, Ala., shows that certain property has been transferred from John B. LeGarde and Lilly LeGarde to the Lehigh Portland Cement Company of Allentown, Pa.

This is but a refiling of the deed which was passed some months ago which deeded the land at LaGarde, including the quarry to the cement company.

The Lehigh Portland Cement Company, Allentown, Pa., has had plans prepared for the erection of a number of plant buildings at New Castle, Pa. Three structures will be built, consisting of a two-story clinker house, two-story storage building, and large power plant for general works service. A new steel and concrete trestle will also be constructed. The work, including equipment, is estimated to cost about $200,000.

The Inter-State Portland Cement Company, Des Moines, Iowa, recently was incorporated under the laws of the state of Iowa, authorized capital stock being $3,100,000. Its incorporators are Paul W. Carroll, Parley Sheldon, L. K. Nichols, George Cosson, W. B. Barney and B. F. Carroll, all of Des Moines, where the main office will also be located. Mr. Sheldon is president, Messrs. Nichols and Barney vice-presidents, Paul W. Carroll, secretary and treasurer, Mr. Cosson, general counsel, and chairman of the board of directors is B. F. Carroll. Their articles of incorporation provide for the making of cement, crushed stone, etc.

With a capital stock of $3,000,000 the Davenport Cement Company, Davenport, Ia., was incorporated under the laws of the state of Delaware recently. Their capital stock of $3,000,000 consists of preferred with a par value of $100.00, while they will also have 30,000 shares of common stock without nominal or par value. The incorporators are Messrs. E. L. Cox, of Chicago, Ill., M. E. Ochs and R. B. Cook, both of Davenport, Iowa.

The Gulf States Portland Cement Co. is installing the foundation for a steel derrick at Warrior River for handling coal to the plant. The derrick will operate a 5-yd. steel bucket. Two new rotary kilns, 6½x60 feet, which will give an additional output of 500 barrels, are also being installed. Other installations include a new Fuller-Lehigh 42-inch fan discharge mill in the coal grinding department, in addition to the 5x22-feet Gates tube mill, seven new General Electric motors for the kiln, and coal finishing department, and a new 300 h. p. water tube boiler, in the boiler department.

A close study and analysis of power distribution and costs, has been in progress for some time at the plant of the Lehigh Portland Cement Company at Iola, Kan. That work was interrupted by the war, but will be renewed during the next year.

Western States Portland Cement Company engineers have begun the construction of a conduit over half a mile long to bring water from Duck Creek to the company's holdings east of Bettendorf, Iowa, J. G. Stancliff, company engineer, stated this week.

By this big work the concern will solve the water problem which has been a serious handicap in the construction of the mammoth plant which the Kansas corporation has already commenced to erect. The conduit, 3,000 feet long, is necessary to bring water for concrete mixing and other construction purposes.

A 75,000 gallon tank is to be erected on the Western States holdings for water storage and pressure purposes. The corporation has installed an electric pump at Duck creek to pump the water to its property.

Although no contract has as yet been signed with the power company here for electric energy to run the Western States plant, it is probable that this action will be eventually taken. The cement company, however, is planning a big building which may be used at present for a sacking room but which can be equipped for a power plant at any time.

The walls, ceilings, floors and footings have been designed with extra strength and thickness to provide for equipment as a power plant should occasion demand.

There is probability of Gosport, Indiana, getting something big in the way of a cement mill. The Marquette Portland Cement Company of Chicago, has leased 1,800 acres with an option for purchase of land east of Gosport Junction. Men in the employ of the company are now drilling all over the land finding the extent and the nature of the material there which can be used in the manufacture of cement. If the investigation proves satisfactory and reports are that this is the case a big mill will be built, the investment representing an investment of about $2,500,000.

Three months was the average life of a belt in the hard, intermittent service of the giant roll drive on the stone crusher in the Edison Portland Cement Company's plant at New Village, N. J.

The power demanded for crunching the limestone, the constant rain of stone dust and bits of rock falling on the belt, and the crusher design that required the use of both sides of the belt, all proved too severe for even the better grades of belting which the company was using. Some of the poorer ones lasted only two weeks.

The prospect of better service from a belt scientifically specified to that gruelling duty was held out by the technical service department of a rubber belting manufacturer. The company authorized them to make an expert analysis of the drive, and co-operated in their work by supplying full information on service conditions peculiar to the plant.

Among other facts, the following salient features of the giant roll drive were noted by the representative of the belting company in his study: the belt drives over the pulley on the first roll, under on the second, and over the driven pulley on the countershaft; all these pulleys are 66 inches in diameter; the drive shaft pulley is 10 feet in diameter, the drive inclines at a 45 degrees angle; speed maintained, 3,300 F. P. M.; the power required is 300 horse.

He recommended a rubber belt, 28-inch, 7-ply—, strong belt, proof against slippage, and liable to little stretch. It has transmitted full power to the heavy rolls with unfailing certainty. It has ended the troubles of cutting and splicing that other belts developed by their tendency to stretch.

It lasted seventeen months before being replaced by another belt of the same quality and dimensions. Throughout its term of service it gave full measure of dependable, trouble-free, powerful transmission. It registered economy in its extra life, in freedom from repair costs, and in demonstrable value as a factor for increased production and general plant efficiency.

These profitable results of rubber belt service on the giant roll have made the Edison operating officials firm believers in the rubber belting company's plan of specifying a belt to its work. They have had them make other analyses, and ordered their transmission, elevator and conveyor belts in accord with the belting company's recommendations.

Lower prices for Portland cement are not considered likely before 1922 by the larger manufacturers. President John R. Morron of Atlas Portland Cement Co. says: "I do not expect any overproduction in 1921. The possibility of a price reduction depends on the supply of coal and labor."

Labor scarcity is the chief difficulty confronting manufacturers. Cars are reported to be available in sufficient number and adequate coal is obtainable, though deliveries under contracts frequently are not being made and open market prices are much higher.

Because of these conditions some mills are operated way below capacity and have been for a year. Country's production this year is falling short of requirements by a considerable margin.

Production of cement this year is estimated at 95,000,000 barrels. In recent years production was as follows:

1919	85,485,000	Barrels
1918	70,915,508	"
1917	90,630,000	"
1916	94,552,296	"
1915	85,914,907	"
1914	88,230,170	"
1913	92,097,131	"

Demand this year is unequaled in the industry's history, but owing to shortage of cars the mills have been unable to bring in their limestone and other raw materials in adequate quantities. As a result, although production in September was 10 per cent greater than in the same month last year and 45 per cent over 1918, the supply of cement ready at the mills is half what it was last year and 40 per cent of 1918 stocks.

Consequently at present prices demand is keeping up well. There is no tendency of buyers to cancel as might be expected if a price decline were foreseen. Present base prices are $2.50 a barrel, Lehigh Valley, and $2.60, Hudson River mills, against $1.75 when Government regulation ended and $2 in March. Adding $1 for sacking (refunded), 30 cents freight from Hudson, N. Y., or 58 cents from the Valley, companies generally are selling dealers at $3.90 a barrel, New York. Some manufacturers, however, have recently fixed prices at $4.09, or in one case as high as $4.59, and find they can do business at the higher prices. Retail sales are between $4.75 and $6.45.

Two large drills have been operating on the George Cox farm, six miles northwest of Fairbury, Neb. The Marquette Cement Mfg. Co., Chicago, it is reported, are paying for the experiment. Sixty holes will be drilled, some of them to a depth of seventy-five feet and samples of the earth at different depths sent east for analysis.

The cement company has leased fifteen hundred acres with the option of purchasing within ninety days. These two drilling outfits pulled in from Indiana from experimenting on a tract of land not suitable for the cement business.

The Alpha Portland Cement Company, Easton, Pa., recently incorporated in New Jersey for $25,000,000, has bought the interests of the Burt Portland Cement Company of Bellevue, Mich., including the mill, farms and houses and all property formerly owned by that company. The new firm took possession November 1st. The old help at the plant will be retained. George R. Burt of Battle Creek, Mich., has for many years been at the head of the Bellevue plant.

The Dixie Portland Cement Company, at Richard City, Tennessee, are making some improvements in their power plant at that place. Mr. W. H. Kline is superintendent for this company.

E. S. Morgan, formerly traffic manager of the Texas Portland Cement Company of Dallas, sailed last week for South America, where he will take the position as vice-president and general manager of the Uruguay Portland Cement Company. He will have the cement mill at Montevideo.

Mr. Morgan has been a resident of Dallas for many years and was connected with the Texas Portland Cement Company until December of last year, when he went to College Point, N. Y., as vice-president and general manager of the Empire Tube and Steel Company.

Test borings are being made near Rollin, Mich., between Posey Lake and the Cincinnati Northern railroad by the Peninsular Portland Cement Company of Cement City, Mich., to discover, if possible, a bed of clay. The clay must pass the test of the chemist and be found in sufficient quantity to pay for mining. Should the tests prove satisfactory, a spur track will be laid to the new bed of this much-needed article. The material now used by the company comes from Paulding, Ohio.

The Davenport Cement Co. has been incorporated in Delaware with a capital of $6,000,000 to own and work stone quarries and to manufacture cement. The incorporators are E. L. Cox, 140 South Dearborn St., Chicago (formerly sales manager German American Cement Co. of La Salle, Ill.); and M. E. Ochs and R. B. Cook of Davenport.

The La Salle Cement Co., La Salle, Ill., increased its capital stock from $1,500,000 to $5,000,000.

State-owned enterprises of one kind or another are not uncommon, even in this land of private opportunity, but few of them can be classed as industrial, at least in the manufacturing sense. Distinctly unusual is the state of South Dakota, which intends to establish and operate their own Portland cement plant, says a recent newspaper article. For this development the sum of $1,000,000 already has been appropriated together with an additional $25,000 for prospecting expenses, and another appropriation of $500,000 is now under consideration for the installation of machinery.

Chester, Ill., on the Mississippi river, 70 miles south of St. Louis, may soon have a new cement mill. After negotiations of several months with noted cement experts of the country, the committee of the Chamber of Com-

merce, which has been conducting the negotiations, and the executive committee of the body have decided to co-operate in the organization of a company with a capital stock of $1,500,000 for the construction and operation of a cement plant.

The gentlemen mentioned have spent upwards of been negotiating are A. J. Meier of the A. J. Meier Industrial Engineering Co. of St. Louis, industrial engineers and promoters of industrial enterprises; Major Leigh Hunt of Hunt Engineering Co., Reliance Bldg., Kansas City, Mo., and Mr. Thomas, Fort Scott, Kan., also Mr. Gordon Wills of Hunkins-Wills Lime Co., St. Louis.

These gentlemen bring into the organization about one-third of the capital required for the establishment of the plant. They ask the co-operation of the Chester Chamber of Commerce in raising a million dollars of the capital stock, understanding that Chester's co-operation will consist only of every moral influence its citizens can bring to bear in the way of expression of faith in the success of the enterprise, enthusiasm in the movement to locate the plant here and such subscriptions to the stock of the company by Chester citizens as their citizens may feel justified in investing upon their conviction that the stock of the company will prove a paying investment.

The gentlement mentioned have spent upwards of $2,000 in expenses and salaries of mining engineers who have spent days in Chester gathering samples of the rock in our bluffs, in having hundreds of these samples analysed and in expenses of numerous trips to the city. Chester citizens have not up to this time invested a cent. These gentlemen have become thoroughly satisfied that the material for the manufacture of cement is in Chester in inexhaustible abundance; they are enthused with the nearness and cheapness of coal, and the transportation facilities by both river and rail are declared by these gentlemen to be unexcelled. No other cement plant in the country is so favorably located for the manufacture and transportation of cement, and they see in the operation of a factory here a most profitable venture.

The stock in the company which remains unsubscribed, these gentlemen say, can be raised within two or three months through interests in New Orleans and Memphis, and by early spring work on the plant can be begun.

Following the discovery of a large quantity of raw material for Portland cement on a farm in Bleckley county, on the Southern railway between Atlanta and Brunswick, Rev. J. J. Bennett, owner of the property, has taken steps to incorporate a company to develop the cement field. The company will be known as the Magnolia Development company, and its headquarters will be at 332 Healey building, Atlanta, Ga.

The Newaygo Portland Cement Co., Newaygo, Mich., is planning to operate to capacity through December and perhaps into January with a view to accumulating as large a surplus as possible to meet winter orders and for a start next spring. The plant shut down early last year and had no stock for the spring trade.

B. F. Affleck, president of the Universal Portland Cement Company, said there was no possibility of cutting the price of cement under the present costs. Cement sells at $2 a barrel at the mill. The dealers in Chicago ask about $4.00 per barrel.

The Chamber of Commerce of Eastland, Texas, is in touch with a concern that has $2,000,000 to invest in a cement plant close to Eastland, if a suitable site can be secured.

This plant is desirous of locating in Eastland because of its proximity to a cheap and plentiful gas supply and the Oil Belt Power company's plant, three miles east of town, which can furnish any amount of electric energy at a greater reduced rate for purposes of this kind.

W. M. Woodall, secretary of the Chamber of Commerce, said that he had virtually been assured this plant would be located here if the site could be secured adjacent to the railway, as there is said to be an abundance of limestone here suitable for the manufacture of cement.

There is but one plant of this kind west of Dallas, Cement City, on the Texas and Pacific railway, and that is at El Paso on the banks of the Rio Grande river.

In line with the policy to keep their mills thoroughly modernized and to adequately provide cement for its trade, The Texas Portland Cement Company, who have but recently doubled the capacity of their Houston mill, now announces that plans are prepared and work has actually started on the installation at its Dallas mill of one new 8x9x220 foot kiln, together with additional raw mill machinery and other construction necessary for the increased output.

Mr. E. J. Steekle, formerly assistant superintendent of the Dixon, Ill., plant of the Sandusky Cement Co., has been appointed superintendent of the Syracuse plant of the same company.

Continued increasing demands for Portland cement have resulted in announcement by the management of the Security Cement & Lime Co. of Hagerstown, Maryland, that the corporation's Security, Md., plant will be doubled in capacity. President Loring A. Cover, 807 Equitable building, Baltimore, is credited with the announcement and engineers are planning to increase the daily capacity of 3,000 barrels of cement to 6,000 barrels, employing 750 men as opposed to the present force of 375. Similar plans are contemplated for doubling the company's output at Berkeley, W. Va., but no decision has been reached. The Security plant is located on the Western Maryland and the Baltimore & Ohio Railways, and has been operating continuously, delayed only by car and coal shortage.

The Monarch Cement Co., of Humboldt, Kansas, recently filed its answer in the anti-trust suit in the supreme court brought by the attorney general. It is one of a number of companies charged with a conspiracy to fix prices and other violations of the law.

Cement mills in the Lehigh Valley district of Pennsylvania report increasing activities during recent weeks and a number of the plants are now working on a day and night shift basis. The Atlas Portland Cement Company, Northampton, Pa., is operating at good capacity at its local No. 2 mill; up to around the middle of September, this plant had been idle for a considerable period, and is now "hitting its gait" in encouraging fashion. The Lehigh Portland Cement Company, Chapman's, and the branch mill at West Coplay, are now producing on the day and night basis. A heavy tonnage is leaving this plant and with present good supply of railroad cars there is little or no opportunity to accumulate a reserve stock. To facilitate production, a number of mills in this district are now packing the bags direct from the cement grinder. The coal supply is good and the only drawback to larger output at some of the plants is the scarcity of good labor. At Coplay, the Coplay Cement Company will build a foundry at its plant.

The Bath Portland Cement Company, Bath, Pa., will make enlargements in its power house to cost about $200,000 with equipment. A system will be installed for the utilization of waste heat from the kilns.

The Lehigh Portland Cement Company, Hamilton street, Allentown, Pa., has had plans prepared for new buildings at New Castle, Pa., to cost about $200,000 including equipment. The structures will comprise two two-story buildings, 40x72 feet and 22x22 feet, with three-story power plant 45x140 feet.

A number of important improvements have been installed in the plant and operation of the Wolverine Portland Cement Co., near Coldwater, Mich. These improvements have to do with the method of handling clay, the installation of a No. 18 pulverizer for clay grinding, the conservation of heat arising from the clinker which is drawn off through a hot air duct by means of an exhauster fan which carries the hot air to pressure blowers, preparations for conserving time in the spring by having on hand a supply of marl, a more complete draft for the boilers, to insure which a concrete chimney is being built. This chimney is 161 feet and 8 feet in diameter. These changes tend to increase the capacity of the plant by making its operation more economical and more nearly continuous. All have been made under the personal direction of H. C. Shields, general superintendent for the company.

The Choctow Portland Cement Co., Geo. Horton, superintendent, quarry and crushing, Hartshorne, Okla., are installing a large new Traylor jaw crusher which will mean a big saving in powder used in dobying. The installation of a No. 66 Smidth Kominuter has increased the raw end output, as have two kominuters of the same type and extra tube mill on the finish end. The plant is running three 8-hour shifts.

The Indiana Portland Cement Co., Greencastle, Ind., has appointed W. S. Morrison traffic manager, L. F. Heerman, superintendent of construction, and John H. Curtis, mill superintendent.

A No. 18 F. L. Smidth mill is being installed in the plant of the Giant Portland Cement Co., Egypt, Pa. They are also installing a new Traylor 48" x 60" jaw crusher and are erecting new bins and tanks for storing coal and stone.

The Ship Canal Portland Cement Manufacturers, Ltd., of Ellesmere Port, England, is considering entering the Texas market with its product, according to a letter just received by G. A. Parkinson, assistant testing engineer, Bureau of Economic Geology of the University of Texas, Austin, Texas. The bureau has also received a sample of cement from the British company to be tested, in order that it may learn whether it comes up to the requirements for such material in this state. The letter to Mr. Parkinson reads:

"We have been receiving recently some very considerable inquiries in connection with shipment of our 'England' brand Portland cement to your market.

"We understand that there is a very big shortage of Portland cement ruling in Texas, and to enable us to deal more fully with the inquiries which we at present have, we are sending you, under separate cover, a sample tin of our Portland cement, as we understand it is necessary for your bureau to determine whether such shipments are up to the required standard."

The Phoenix Portland Cement Co., Nazareth, Pa., is installing in its plant four large compartment tube mills in the finish end to replace a battery of old ball and tube mills, some of which have been in operation for 20 years. These mills will be driven by individual motor, 400 H. P. each, connected to the pinion shaft of the mills with Link-Belt silent chain drives. This new installation will have a capacity of over 100,000 barrels of cement per month, and will be one of the most modern installations in the country when completed. Last year the company made extensive improvements and additions to its raw grinding department and coal mill, which have proven very efficient in every respect.

The Bessemer Limestone & Cement Co., Youngstown, O., has started the operation of one-third of the kiln capacity of its new cement plant at Bessemer, Pa., and expects to have its entire capacity engaged in production by the first of the year. Buyers are placing contracts at current prices for next year's delivery.

Electrical power at the plant of the Burt Portland Cement Co., Bellevue, Mich., is developed by one 750 K. W. Westinghouse generator operated by an Allis-Chalmers engine and another similar unit of 350 K. W. capacity. The current generated is 440 volt, 3 phase, 25 cycle. Exciting and lighting current are generated by 75 K. W. D. C. unit.

There are 58 motor installations ranging from 10 to 125 horsepower, the latter for the large crusher. Most of the machinery is driven by individual motors, although there are instances of group drive from a common shaft, as in the case of the dryers. The motors are principally Westinghouse.

All electrical repair work, rewinding of stators, reinsulating of rotors, etc., is done by the chief electrician's force in a special shop building for the purpose.

One of the big steel companies in the Chicago district has recently adopted a set of specifications for leather belting which are of sufficient interest to publish for the benefit of the many large buyers who read these pages. The specifications cover belting for general use, and special belts of course are excluded from their provisions. Following are the specifications:

MATERIAL.

The belting must be of the best-quality oak-tanned leather, free from all ingredients in any way injurious to the life or wearing qualities of the belt, or that simply add to its weight.

LOCATION OF CUTS.

Belting must be cut longitudinally and no piece of hide must exceed 54 inches in length. Widths less than 7 inches are to be cut within 15 inches of the center of the hide; widths 7 inches and over are to be cut from the center of the hide; neither shoulder, belly, side, nor flank stock, nor any padding nor shimming will be permitted. Belting must be of uniform thickness and width and perfectly straight from end to end.

LAPS.

Laps must not be less than 4 inches nor more than 8 inches, excepting that in single belting 8 inches and over in width, the lap may be 1 inch longer than the width of the belting; no lap should be within 4 inches of the end of a strip. Laps must be thoroughly cemented and when pulled apart the exposed surfaces must not show any resinous, vitreous, oily or watery condition; no rivets will be permitted.

TESTS.

Belting must have an ultimate tensile strength, both in leather and in the splice, of not less than 360 lbs. per square inch and must not show an elongation in 2 inches to exceed 13½% when measured under a load of 225 lbs. per square inch for 1 hour.

Test pieces for tension test and elongation test will be cut from belting with a die and will have the dimensions commonly required for such tests.

ILLUSTRATION.

Belting must not crack open on the grain side when doubled strongly by hand with the grain side on the out-

side nor must it show piping or raising on the grain side when similarly treated with the grain side on the inside.

When belting is required for any special purpose, the manufacturer will be notified as to the nature of the work, maximum horsepower, speed, etc.

WEIGHTS.

Belting not waterproof must come within the following range of weights which must be guaranteed to be not more than 10% in excess of the actual weight of the leather.

	Minimum wt. per sq. ft., oz.	
Width, Ins.	Single belting. belting.	Double belting. belting.
1 to 2	13	24
2¼ to 4	14	26
4½ to 5½	15	28
6 and over	16	28

MARKING.

Belting must be marked every 10 ft. with the manufacturer's name, trade mark, or equivalent identification mark.

REJECTION.

The purchaser reserves the right to reject any portion or all of the material which does not conform to the above specifications in every particular, and to return the rejected material to the manufacturer or seller for full credit at price charged f.o.b. point of delivery specified by the purchaser. If the material is to be replaced, a new order will be entered at prices, terms and conditions acceptable to the purchaser.

News of the Gravel and Crushed Stone Plants

The quarry and plant of the Temescal Rock Company at Corona, Calif., has been purchased by the Diamond Plaster Company of Los Angeles, Calif. The plant is electrically operated and is equipped with modern machinery of the latest improved type, including an 84x66 inch jaw crusher, No. 9 gyratory crusher, two 48″ and one 24″ Symons disc crusher, manganese steel screens, 100-ton shovel, etc. Temescal rock is used extensively by contractors and builders because of its toughness and light weight. The abrasive tests, it is stated, have shown that this rock loses only 10 per cent in the crushing process, while rock crushed from ordinary granite boulders loses as high as 33⅓ per cent.

Rockville Granite Co., Cold Spring, Minn., recently organized, capital $200,000 has taken over the business of the Rockville Granite Co. and Alexander Bros., Rockville, Minn. Ferdinand Peters is president of the new company and John C. Alexander is secretary. The new organization has purchased the Cold Spring Water Power plant for $35,000, which will give them about 300 h. p. A lot of new machinery will be purchased. They are opening up a new plant at Cold Spring.

Chas. G. Sonntag, Gaston, S. C., has organized the Sonntag Sand & Cement Co., and will develop a pit at Dixiana, S. C., on the main line of the S. A. L. R. R. He needs a partner with experience and some capital.

The Texas Stone Company, Dallas, Texas, against which an involuntary petition of bankruptcy was filed on August 18, alleging the company was bankrupt to the extent of $290,460.36, filed an answer to the petition yesterday with Louis Maynard, clerk of the Federal District Court. In the answer the company admitted bankruptcy, and that it was a non-profit-making concern. Its assets amounts to $275,511.94, the answer states.

The involuntary petition was filed against the company by its creditors, G. L. Meholin, secretary of the company; the Hargreaves Printing Company and J. O. Spring, all of Dallas. J. D. Kugle has been appointed receiver of the company by E. M. Baker, referee in bankruptcy. A meeting of the creditors will be held shortly when a trustee will be appointed.

Traylor ball mills are especially adapted for producing pulverized agricultural lime. The Traylor Engineering & Manufacturing Co., Allentown, Pa., claim their ball mills are the simplest and most efficient pulverizing machines made; running at slow speed and are dustless. They require no screens and they require the minimum attention. They consume the minimum amount of power per ton of rock crushed and will pulverize crusher rejections as readily as they will screenings.

The Johnstown Slag Company, Johnstown, Pa., have begun operation of their new slag plant at that point. The slag is from the Cambria Steel Company and is dug by Bucyrus 70-C shovels and loaded in twelve yard all steel dump cars and hauled to the crushing plant where the metal from the slag is reclaimed by electric magnets.

The Casparis Stone Company have completed the erection of their Bucyrus Class-24 Dragline. This machine will be used in stripping their stone quarry at Connelsville, Pa.

The Union Rock & Gravel Company of Los Angeles are having their troubles in attempting to supply materials to the many building and road contracts now in progress in the metropolis of California. On account of the difficulty in getting hold of cars to move the material from their several outside plants, they have decided to open up what is known as the Brush Canyon quarry in the north part of the city and will make deliveries from this quarry by truck, thus relieving the car shortage considerably. They already have three standard Bucyrus shovels in use in their operations and have decided to use a 30-B revolving caterpillar shovel on their Brush Canyon work. Mr. Herbert Stone is the treasurer and active manager of the company's large operations. Mr. H. C. Chenoweth is the superintendent.

The Biwabik Sand & Gravel Co., Biwabik, Minn., are having splendid success in their new venture. The plant has a daily capacity of 600 cubic yards and is equipped with modern machinery of the latest improved type, including two Austin crushers No. 3 and No. 5, and a model 18-B Bucyrus shovel. They are installing a new locomotive crane for stock piling in slack time, and a 24″ belt conveyor, 75′ center, from receiving bin to crushers.

News of the Concrete Products Factories

There is nothing that so augurs for success in the concrete block business as to go out after the right kind of business from the outset. Many an enterprise fails from lack of imagination. The man behind the enterprise fails to realize the possibilities of his enterprise. He is satisfied with half raters; he goes after small jobs; he interests small builders; he doesn't get his proposition before men who would help him to sell it to the public at large. That is the reason we see so many concrete block in foundations—not very good looking block—and so few block in the superstructures of the better class of buildings.

There is nothing that succeeds like success. The chap who goes out with a big aim to put his proposition across in a large way may not reach the degree of success at which he aims, but he will get a good deal farther than the fellow who starts out to run a small fry business and doesn't try to make it anything better.

The Camden Cement Tile Company, Camden, Indiana, is a growing concern taking rapid advantage of the increasing demand for concrete in the tile field. Originally started as a company for the purpose of manufacturing building blocks, porch columns and similar products, cement stave silos, concrete tile was added as a side line. This end of the business, however, has become the largest, and their tile plant is probably the largest east of the Mississippi River. The Camden Company makes tiles from 4 inches to 32 inches in diameter from 3 parts of sharp, clean sand and gravel and one part of cement. The tile are then steam cured in concrete steam kilns for 48 hours at a temperature of about 120°.

The quick working hand drain tile machine sold by the Besser Sales Co., 1311 20th St., Alpena, Mich., makes the pipe up to 8 inches in diameter and in 12-inch lengths. This is an unusually efficient quick working device with which from 500 to 600 feet of tile per day can be turned out. The quick working tamper makes a tamped, high quality product for which there is a ready sale. This is a very inexpensive outfit with a very large capacity.

The No. 2 power drain tile machine makes pipe up to 12 inches in diameter and in 12-inch lengths. It turns out product at the rate of five tile per minute, giving a capacity of 3,000 feet of tile per day. This is a low priced, very efficient automatic equipment in which the machine does all the work and labor is only required to feed raw materials and place and remove the casings.

The Besser No. 1 drain tile machine has a wider range of products and large capacity. It makes drain pipe up to 16 inches in diameter. It will also make tongue and groove sewer pipe from 8 to 15 inches in diameter. It makes either drain or sewer pipe in 12, 18 or 24-inch lengths. It has a capacity of 4,000 feet of tile per day. This is a completely automatic machine employing a minimum of labor and turns out an unsurpassed quality of pipe which can be made in either plain or corrugated walls.

The large power tamp pipe machine makes plain end pipe up to 48 inches in diameter and tongue and groove sewer pipe up to 36 inches in diameter, making same in either 24 or 30-inch lengths. It will make either reinforced or non-reinforced pipe. The pipe is made conformable to the specifications of the American Society for Testing Materials so that the pipe can be used for a variety of purposes. This is a very large capacity completely automatic machine having the largest production of large diameter pipe of any equipment made.

The Omaha Concrete Stone Co., Omaha, Nebr., has a daily output of 4,000 blocks and it is expected to increase the capacity to meet the growing demands. They operate ten Ideal machines, Peerless brick machine and a Blystone mixer, and they expect to work all winter if they can procure enough sand and coal. Mr. A. G. Swanson, secretary-treasurer, writes: "We have been very busy making blocks for and building foundations, but we have furnished no block for nor built entire concrete block houses. The contracting end of our business has averaged about two foundations per day since the first of January, as we operate six or seven gangs on the outside. We have sold additional blocks for about that many more each day, but as concrete block are a little unpopular for the erection of complete houses, and as we have had our hands full to take care of the business anyway, owing to the shortage of labor and difficulty in getting material, we have not pushed the sale of concrete block houses. This company is interested in crushed white marble and white sand for facing blocks, also interested in truck conveyors for moving block racks."

The Wilson Concrete Products Corporation, 79 Richmond avenue, Lockport, N. Y., has erected a new plant equipped with a Besser brick machine, which has a capacity of 30,000 concrete bricks per 10-hour day. These bricks are being used for face brick and have given very satisfactory results, in fact they are superior to most of the present clay brick. They are tampered under 15-ton blow in steel molds, insuring a straight and perfect brick which stands 1930 pounds per square on crushing test and 485 on rupture test. They are steam cured which insures an even setting of the aggregate. In weight they average about five pounds which is lighter than shale brick. Masons who have used them say they can lay them faster than clay or shale brick. The factory is also equipped with a Dunn automatic tile machine with a capacity of 1500 feet of drain tile, all sizes from 3 inches to 12 inches. A quantity of this product has been delivered to farmers in the surrounding country and has been pronounced a very fine product. Sewer and water pressure pipe will be the next product which the company will put on the market, using their own sewer pipe molds. The officers of the company are: Raymond Wilson, president; Ed. E. Wilson, vice-president; C. E. Wilson, secretary-treasurer, and Carl F. Stevenson, superintendent. The company operate a Hobbs block machine, Besser mixer and they get 30 cents f. o. b. works for their blocks which are faced with crown point mica spar crystals. The brick sell for $21 f. o. b.

Thirty-eight milk houses have been built by the Cement Products Construction Co., Walworth, Wis., all of which are giving the best of satisfaction. They manufactured 37,000 concrete blocks, 8x8x16, during the past twelve months and they used Medusa waterproofing compound in the facing of the blocks.

Since the days when the first concrete sewer pipe manufacturer jogged contentedly astride his horse to a contract letting, pipe men have progressed rapidly. Now we have a contractor not content even with the automobile.

G. Paul Musselman, president of the Musselman Con-

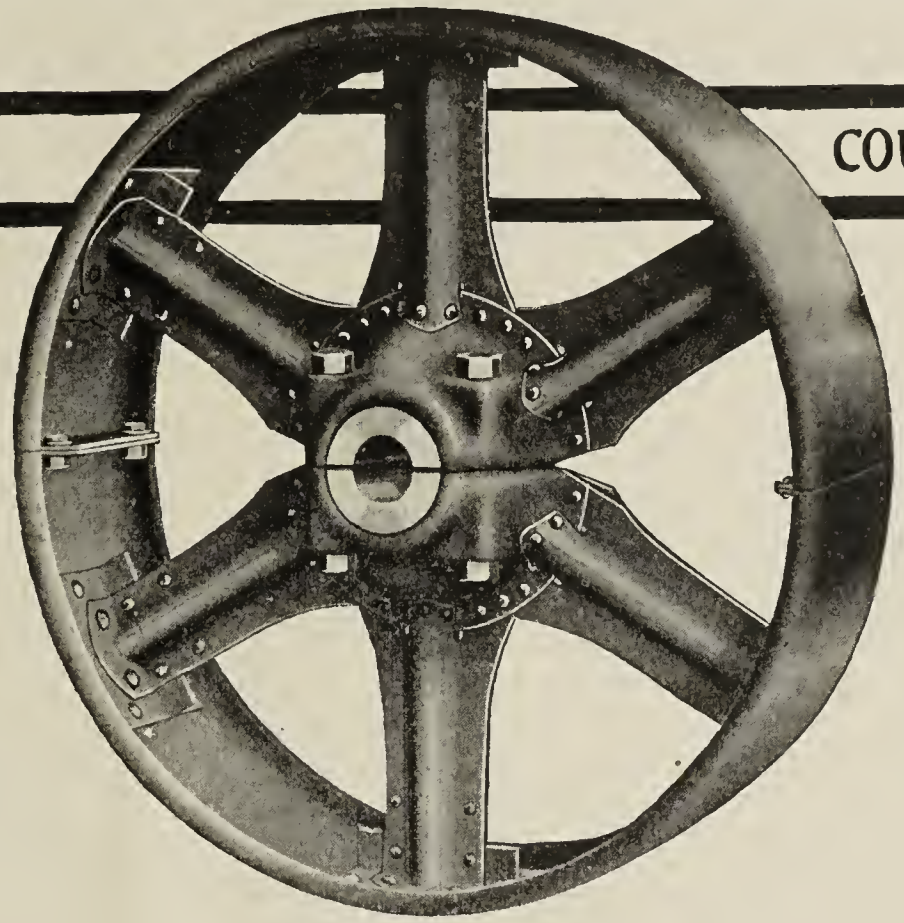
Oneida Steel Split Pulley

TRANSMITS POWER AT LOWEST COST

Arms and Hubs Are Interwoven

OVAL CROWN

COUNTER SUNK RIVETS



Oneida Steel Pulleys may be run with perfect safety at any speed at which it is practicable to operate a belt. The fish-plate arm to rim connection makes it a "safety first" pulley in every sense.

The arms, as well as the hubs, of the Oneida are made in two pieces. They are interwoven into the flanges of the hub and securely riveted into place. The perfect oval crown insures the greatest possible belt grip or adhesion. Transmits maximum power at minimum expense of belt pull or tension. Loose belts mean less bearing friction and saving of belts. Order Oneida pulleys from your dealer.

DODGE

Dodge Sales & Engineering Company, distributor of the products of the Dodge Manufacturing Company and the Dodge Steel Pulley Corporation. General Offices: Mishawaka, Ind. Works: Mishawaka, Ind., and Oneida, N. Y.
Canadian Plant: Dodge Mfg. Co. of Canada Ltd., Toronto and Montreal

Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark

crete Pipe Co., of New Holland, Pa., uses an aeroplane as his conveyance. Recently he and his pilot started on a trip to Harrisburg to attend a special contract letting.

Mr. Musselman, in speaking of his plane, says: "From an advertising standpoint, the aeroplane has been of great value to us in the development of our business. Although we cannot deliver our products or carry our raw materials because of prohibitive weight, we find that money invested in flights is the cheapest advertising we can do. This advertising is especially effective as it appears in the papers as news and is read by many who otherwise would not see it.

"As a recreation flying is without doubt the most interesting and delightful form of amusement. I have taken quite a number of lessons on the operation of the plane, and I believe that the amount of money which many business men expend in golf, if invested in flying, would provide all the thrills of golf besides being a novelty and without the incentive to profanity that sometimes accompanies the beginner's game of golf."

Mr. Musselman also manufactures concrete blocks, using Zagelmeyer molds.

From the office of the secretary of the American Society of Agricultural Engineers, Ames, Iowa, comes the announcement that the transactions of the society for the last year are off the press and being distributed. Copies can be furnished to non-members at $1 each, and it is stated that a limited number of sets, consisting of eleven volumes covering the last ten conventions can be supplied to non-members at $9 a set. The new volume consists of slightly more than 200 pages. Some of the leading papers are:

"An Extension Project in Land Drainage," by E. R. Jones.

"Project in Farm Buildings," by Daniel Scoates.

"Country Water Systems," by L. C. Landis.

"What We Know and What We Guess in Drainage Design," by David Weeks.

The committee on local arrangements announces that the annual meeting of the American Society of Agricultural Engineers December 28, 29 and 30, will be held in the Crystal Room of the Hotel Sherman, Chicago. It is expected that the program will include a banquet.

Crown Point Spar Co., 663 Broadway, New York, N. Y., producers of scientifically milled micaspar, are distributing an interesting pamphlet entitled "Micaspar —How to Use It.' The pamphlet, which is illustrated with views of concrete objects including blocks, garden ornaments, and buildings, contains much useful information of value to the producer of concrete stone. Micaspar gives to concrete a permanent sparkling granite face. Besides adding a pleasing appearance to concrete in which it is used, it produces a wearing surface much more durable than ordinary aggregate. Micaspar is so hard that it cannot be crushed in the ordinary power crusher. Because it has a two-way cleavage, it breaks into irregular but generally cubical crystals which are easily separated by screens into sizes that approach uniformity. This is an important item because the micaspar produced by the Crown Point Spar Co. is carefully screened into various sizes and then the separate sizes are recombined into an aggregate possessing a minimum amount of voids. Since the durability of concrete stone depends upon the elimination of voids, the recombined aggregate is capable of producing a synthetic stone that has unusual wearing qualities. Besides describing the details involved, in the production of micaspar, the pamphlet specifies methods of proportioning, mixing and applying finish coats to exposed concrete surfaces. One of the fundamental precepts that must be observed in producing any concrete stone is that careful workmanship is as important as first-class material. This fact is emphasized throughout the pamphlet. The instructions specifying the methods to be employed in applying and finishing surface coats are valuable to contractors and concrete manufacturers engaged in this class of work.

"Keeping abreast of the times" was the reason given by President D. F. Shope, of the Shope Brick Company, Portland, Ore., when asked what lay back of the expansion of his plant. "The business world today wants to deal with specialists," he continued, speaking of the lessons learned in his thirty years' experience in manufacture of brick, clay as well as concrete, "and the specialist is one who becomes proficient in one line. With the manufacturer it means that he must specialize in making a certain product. So, to keep abreast of the times we are expanding and centering our energies on the production of a perfect concrete brick, waterproof in this climate and free from discoloration in all kinds of weather."

A few concrete facts about his concrete brick plant were given by President Shope, who lets us in on one secret—that a concrete brick plant can be established at a much less cost than a clay brick plant of equal capacity, and that with the equipment he is installing he will get 100 per cent efficiency in uniformity of size and color of product as against 50 per cent efficiency in clay.

Shope patents cover the machinery and processes used by the Shope Brick Company for making brick. These machines are manufactured in Portland, Ore., and sold along with territorial allotments to manufacture Shope process bricks. These rights have been sold as far East as Michigan.

The first unit of the new Shope Brick Company plant is completed at Eighth and Division streets, Portland, Ore. The building is three stories high and sixty by sixty feet floor space. It is to be extended to cover the entire block.

J. S. Firey, 111 Spruce street, Winston-Salem, N. C., has in operation a modern concrete products factory equipped with Hansen roofing tile machine, Besser and Hobbs block machines, Besser tamper, Crescent drain tile machine, Helm brick machine, Blystone and a Kent continuous mixers and Mica Spar Crystal Co.'s and Georgia Mineral Products Co.'s facing materials. Is interested in roofing tile, building tile, burial vault, porches and flower box molds, also waterproofing compound.

An attractive collection of ornamental cement work adorns the show window of Balaam and Balaam, real estate men, in the San Marcos block, Santa Cruz, Calif. There are vases, urns and other cement product creations, the work of the Lewis Cement works, of which A. F. Lewis is manager. At their big plant at 111 State street skilled workmen are engaged turning out all manner of cement products for the homes and grounds of this city, Montecito and neighboring sections. The coloring in these cement products is an added attraction.

The Lewis Cement works is furnishing cement brick and other cement products for a number of new homes now under construction in this city, Mission Canyon, Montecito and other sections, and finds a growing demand for cement construction in home building.

While ornamental work for the gardens of this section is a specialty of the Lewis cement works the plant is also furnishing a large amount of cement brick and is also making cement pipe for irrigation systems, in fact everything in cement can be made on short notice, and Mr. Lewis says the plant is meeting the growing demand.

Index

Vol. 32, January—December, 1920

DESCRIPTION OF PLANTS

	Page	No.
Burt Cement Plant	24	11
Cement Products Plant	32	6
Central Proportioning Plant	27	2
Central Loading Plant	44	1
Flooded Gravel Pit Operation	22	10
Gravel Washing and Crushing Plant	44	4
Great Western Cement Co. Plant.	30	7
Gilmore Cement Mill	24	6
Marl Cement Plant at Stroh	19	10
New Indiana Cement Mill	23	2
Northwestern States Cement Plant	24	2
Olympic Cement Plant	23	5
Quarry Crushing Plant	37	2
Riverside Cement Quarry	31	9
Superior Portland Cement Plant	35	10
Sand and Gravel Handling Plant	30	9
Star Sand Co. Plant	28	7
Southwestern Cement Co. Plant	34	2
Western States Cement Mill	28	4

SPECIAL ARTICLES

	Page	No.
Chartered Summary of Road Specifications—A. N. Johnson, C. E.	32	1
Construction of Oil Reservoirs—H. B. Andrews	39	2
Contractors and Their Bonding Companies—C. H. Bancroft	23	6
Concrete Tank Construction—L. J. Mensch	26	8
Conveyor Belt Progress—T. A. Bennctt	29	10
Cost Cutting in Road Construction—F. E. Miner	21	11
Detonators for Blasting—J. B. Stoneking	28	8
Education for Safety in Cement Plant—J. C. Josse	29	1
Efficiency of Rotary Kilns—W. E. Snyder	40	6
Efficiency Increase of Laboratory Tests—G. M. Williams	18	8
Exposure Confidence Game in Building Industry—C. A. P. Turner	19	11
Future of America 1920—Geo. M. Reynolds	22	3
Future of American Cement Industry—Stephen Mambert	23	4
Handling Material with Few Men—E. E. Neuviller	31	11
Investment Valuc of Concrete Building—J. P. H. Perry	37	3
Industrial Relations—L. P. Coppock	28	9
Industrial Relations—J. K. Jensen	21	12
Making Concrete Roof Tile—D. Helmuth	22	5
Owner Protection in Building—F. A. Wells	23	2
Plant Efficiency by Analyzation—R. W. Barnes	44	4
Proper Treatment for Transmission Belts—E. J. Black	26	7
Rubber Belting in Cement Mill—R. W. Ford	30	8
Rotary Kiln Efficiency—Alex B. Leipper, A. I. C.	37	8
Safety Factors in Explosives—Dr. W. O. Snelling	34	1
Safety Hazards of Cement Industry—O. C. Soderquist	24	5
Standards in Constructon Work—Ernest I. Trigg	26	6
Success Concrete Products Business—C. J. Davis	30	6
Why Concrete Oil Tanks—C. W. Freitag	29	2
Broken Bolts and Screws—Chas. Labbe, M. E.	26	9
Blasting Concrete—S. R. Russell, C. E.	34	3

PORTLAND CEMENT

	Page	No.
America Safety for Testing Materials	18	10
Better Conditions for Cement Companies	22	1
Buying Cement	17	11
Cement Plants Erected Since 1906	22	1
Cement Prices Not Unreasonable.	28	4
Cement Demand in Texas	35	9
Cement Prices Remain High	17	11
Cement Manufacturers in Texas	20	12
Educating Plant Employees	29	1
Friction Surface Belt in Plant	27	9
Future of America Cement Industry	22	4
New Mill in South	45	1
Petosky Cement Mill	41	1
Portland Cement Production in 1919	25	4
Rotary Kilns	40 6 37	8
Return Sacks	29	7
Storage Cement Tests	42	4

SAND, GRAVEL, CRUSHED STONE AND GYPSUM NEWS

	Page	No.
Assays of Rock	31	2
Agriculture Lime 1918	41	3
Bluffton Lewisburg Quarry	26	3
Crushed Stone Quarry News	29	4
Crushed Stone Quarry News	29	5
Crushed Stone Producers Meet.	31	2
Dust Collectors in Crushing Plants	45	1
Explosives in Quarrying	34	1
Economical Sand and Gravel Pumping	44	3
Excavating a Rock Mountain	33	8
Gravel in Nebraska	27	8
Hydrated Lime in Concrete	23	8
Hydrated Lime in Concrete	39	3
Increased Use of Limestone	22	1
Illinois Sand and Gravel Plant	24	11
Limestone Increases Production	311	1
Large Production of Phosphate Rock	43	1
Limestone for the Farm	40	2
Lime Industry	33	6
Lime and Fire Protection	24	12
Modern Crushing Plant	44	4
News of Sand and Gravel Plants	42	6
News of Crushed Stone Quarries	46	6
News of Gravel and Crushed Stone Plants	36	9
News of Gravel and Crushed Stone Plants	36	10
National Crushed Stone Convention	19	3
Ohio River Sand Supply	23	5
Operating Flooded Pits	22	10
Plenty of Stone Sand and Gravel for 1920	22-26	3
Plant News	39	7
Quarry News	40	7
Quarry and Crushing Plant	37	2
Sand, Gravel and Crushed Stone for Roads	44	2
Sand Lime Brick Convention	28	3
Standardize Crushed Stone Sizes.	36	3
Sand and Gravel News	27	4
Sand and Gravel Plant News	28	5
Sand, Lime and Brick for 1919	18	10
Sand and Gravel in Michigan	22	11
Texas Quarry	33	11
Withholding Cars in Sand and Gravel Industry	19	7

NEW BOOKS

	Page	No.
Concrete Steel Construction—Eddy & Turner	31	1
Concrete Block and Brick	30	2
Cement by Bertram Blount	21	9
Cement for Town and Farm	24	9
Data Book on Reinforced Concrete	20	1
Electrical Precipitation	22	1
Estimating Concrete Buildings	22	7
Electric Shovels	28	10
Ford Car Fordson Tractors	23	8
Gasoline Situation	18	10
Modern Belt Joining Methods	35	7
Metal Forms	27	11

Index (Continued)

	Page	No.
Perforated Metals	30	5
Portable Conveyors	25	10
Steel Lumber Handbook	31	1

DESCRIPTION OF NEW MACHINERY

Austin Wagon Loader	30	2
Air Compressor for Quarry	43	6
Cover for Rheostats	38	2
Crescent Belt Fastener	37	9
Composite Concr. Prods. Mach.	22	12
Detachable Anchor Bolt	43	1
Dodge Friction Clutch	35	2
Dunn Mixers	35	5
Deep Blast Drilling Machine	25	6
Detonators	28	8
Dredge Pumps	34	11
Friction Surface Belt	27	9
Handpower Bending Tool	45	1
Handy Blasting Machine	27	8
Jumbo Gravel Digger	44	6
Jaeger Paver	47	4
Kent Mortar Mixer	42	6
Lincoln Highway Pavers	42	4
Limestone Pulverizers	23	11
Mechanical Overload Release	25	9
New Flexo Moulds	27	12
Revolving Shovel	48	4
Rubber Conveying Belt	29	12
Sullivan Rotator for Drilling	47	4
Steel Bender	26	5
Sullivan Plug Drill	34	11
Sharpener for Drill Steel	21	10
Twyncone Friction Clutch	21	10
Traylor Super Pump	18	7
Type K Loader	42	3
Universal Belt	29	12

EDITORIALS

Be Prepared	22	6
Better Granaries Demanded	17	7
Building Modern Highways	17	8
Business Conditions	18	9
Comparing 1919-1915 Construction Cost	19	9
Foreign Trade Service	20	1
Foreign Trade	18	9
Golden Rule in Business	18	12
It Pays to Build Well	19	3
Industrial Democracy	22	6
Keep the Cement Stacks at Work.	21	4
Make Your Business Better	18	9
National House Construction Conference	20	1
Vital Message to Business America	18	12
Nothing Like Experience	20	2
Our Vast Unused Energy	17	11
Push Post Business	20	2
Push Concrete Coal Pockets	16	5
The Purchasing Agent	18	11
Hydrated Lime in Concrete	39	3
Hardening Concrete by Steam	31	4
Investment Value of Concrete Buildings	36	3
Industrial Project	20	7
Water-Power Unused is Waste	17	10

GENERAL CEMENT MILL NEWS

Pages 32, 33	2	
Pages 32, 33	3	
Pages 36, 37, 38, 39	4	
Pages 32, 33	5	
Pages 38, 39	6	
Pages 33, 35	7	
Pages 34, 35	8	
Pages 34, 35	9	
Pages 33, 35	10	
Pages 35, 36	11	

CONCRETE AND CONCRETE CONSTRUCTION

Artistic Concrete Tile Roofing	39	6
Aggregate Shortage of 1920	22	2
Advantages of Cement Stave Silo	27	3
Blasting Concrete	34	3
Breaking Up Concrete	30	5
Breaking Up Concrete Piers	36	5
Crushing Stone for Ry. Ballast	28	12
Combined Sewer and Gutter	30	4
Concrete Alley Paving	33	4
Concrete Street Waste Boxes	33	4
Concrete Roofing Tile	22	5
Concrete Testing Methods	31	6
Concrete Products Factory	32	6
Concrete Gas Tanks	37	6
Cement Stucco on Concrete Block	44	6
Concrete Roads in Nebraska	21	8
Construction of Concrete Tanks	23	8
Concrete Corn Cribs	31	8
Cracks in Reinforced Concrete	32	8
Concrete Homes for Workers	25, 28	1
Concrete Cover for Steel Stack	30	1
Concrete for Long Spans	38	1
Concrete Silo	39	1
Concrete Street Construction	44	1
Concrete in Water	31	2
Cracking of Concrete	42	2
Concrete Block and Stucco Bungalows	22	9
Concrete Fence Post for Fence	32	9
Concrete Made Without Sand	33	9
Concrete Brick Residence	38	9
Concrete Milk House	27	10
Concrete Chimney	32	10
Cutting Cost of Roads	20	11
Concr. Storage Tanks	25	12
Delivering Concrete by Gravity	21	6
Detachable Floor Forms	31	1
Detachable Anchor Bolts	43	1
Demolishing Concrete Bridges	34, 40	2
Discuss Concrete Roads	19	3
Decorative Possibilities of Concrete	18, 19	5
Effect of Rodding Concrete	26	4
Effect of Oil on Concrete Tanks.	42	6
Fireproof House Construction	34	7
Floods Prevented by Concrete Wall	42	3
Longest Concrete Arch Span	21	5
Largest Concrete Ship	21	9
Laboratory Test Concrete	18	8
Mesh Reinforcement in Pavements	31	12
Mortar Joints of Blocks	25	5
Michigan Concrete Road Work	27	2
Modern Stucco Houses	23	7
Modern Concrete Granaries	22	8
News of Concrete Product Factory	45	4
News of Concrete Product Factory	37	5
News of Concrete Product Factory	47	6
News of Concrete Product Factory	36	7
News of Concrete Product Factory	38	8
News of Concrete Product Factory	38	10
News of Concrete Product Factory	39	11
New Uses for Silo Forms	17	5
New Concrete Bridges for Wyoming	27	5
New Type House Construction	21	7
National Conference Concrete House Construction	20	2
Oil Storage Plant 23,	24	1
Organic Impurities Injure Concrete	17	8
Ornamental Concr.	24	12
Portable Plant for Aggregates	28	2
Plan for Cement House	40	2
Protecting Concrete Building from Damp	40	3
Parafin to Make Walks Tight	41	3
Question Box	27	10
Rodding Concrete for Strength	38	1
Reinforced Concrete Oil Reservoirs	39	2
Reinforcing Concrete Properly	33	9
Sea Water on Concrete Construction	30	12
State Concrete Roads Specifications 32,	33	1
Speed of Constructing Concrete Buildings	40	1
Stave Silo Association of Iowa	21	3
Safe Winter Concreting	28	3
Success in Concrete Products Business	30	6
Sparkling Granite Facing	33	7
Sharp Sand Better for Concrete	43	6
Straightening Leaning Silo	20	8
Sea Water on Reinforced Concrete	41	3
Selling Concrete Burial Vaults	43	4
Santa Monica Concrete Pier a Failure	26	5
Standard Oil Warehouse	17	9
Strome System of House Construction	26	10
Tests, Corrosion	21	9
Test Concrete Before Placing Forms	28	11
White Concrete Mortars	28	10
White Cement Bricks	30	10

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